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THE

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OF THE

TEA RESEARCH INSTITUTE

OF CEYLON.

Edited by

J. LAMB, M.Sc., A.R.I.C., A.I.C.T.A.

Director, Tea Research Institute.

THE TEA RESEARCH INSTITUTE

St. Coombs, Talawakelle,

Ceylon.

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The Tea Research Institute of Ceylon.

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NOTE

The Laboratories of the Institute are situated at St. Coombs Estate, Talawakelle, and letters and enquiries should be addressed to the Director, Tea Research Institute of Ceylon, St. Coombs, Talawakelle. Telegraphic Address :—Research, Talawakelle, Telephone, Talawakelle 44 (Private Exchange). It is particularly requested that letters should not be addressed to officers by name.

THE TEA QUARTERLY.

VOLUME XXII. MARCH, 1951. PART I

EDITORIAL.

The Ninth Biennial Conference.

The attendance (approximately 680 persons) at this conference was more than double that at any previous conference held by the Tea Research Institute. Shortly after the announcement of the date of the conference, the number of requests for invitations was so large that it was obviously impossible to provide suitable accommodation anywhere in Nuwara Eliya, which had been selected as the most convenient town in which to hold this particular conference in which blister blight was to play a prominent part.

Arrangements were therefore made for two complete sessions. The first session was held on the 1st and 2nd December, 1950, and representatives of Colombo agency houses, visiting agents and senior superintendents were asked to attend this session if possible.

The second session was held on the 4th and 5th December, which the more junior superintendents were requested to choose provided that the number could be reasonably equally divided. Approximately 300 persons attended each session. The Clifford Pavilion proved to be a very suitable building with comfortable seating, good acoustics and ample provision for the projection of slides and films.

The Institute was specially requested to expedite publication of the papers on blister blight control, and the papers on the subject were published immediately after the conference in part IV of the *Tea Quarterly* for 1950 (Volume XXI). The remainder of the proceedings and the discussion of the first day of both sessions are published in this number and are followed by an account of the proceedings on the second day of each session. The account of the discussions combines the proceedings of both sessions.

PROCEEDINGS OF THE NINTH BIENNIAL CONFERENCE OF THE TEA RESEARCH INSTITUTE OF CEYLON.

Opening address by the Chairman of the Board of Control, R. C. Scott, Esqr., C.B.E.

Gentlemen: It is with regret I inform you that neither the Prime Minister nor the Minister of Agriculture are able to be present this morning to open this conference, but I am pleased to inform you that a senior Government official in the person of the Tea Controller, Mr. A. O. Wirasinha, is present with us. I am also honoured to inform you that His Excellency the Governor-General is making a special journey to Nuwara Eliya in order to be present with us at about 11.00 a.m. tomorrow, when we shall have the pleasure of hearing a few words from His Excellency.

Before I proceed, I would like to take this opportunity of congratulating Mr. Lamb, M.Sc., on his first appearance as Director of a conference. I am sure you will all agree that we are fortunate in having as our Director one who has such extensive and profound knowledge.

I also extend a welcome to Dr. F. Haworth, Ph.D., our Agricultural Chemist who, I trust, will in due time effect valuable research by soil analyses, especially in respect of minor element deficiencies; to Mr. T. E. Walter, B.Sc., who will be responsible, mainly, for the development of the Low-Country Sub-Station, and to Mr. J. Landreth, our Engineer, who has already been of great assitance in our fight against blister blight. In his opening address, the Director will refer more specifically to these gentlemen and to those that are no longer with us.

I extend a cordial welcome, first to distinguished visitors who are either working or resident in Ceylon in the persons of Professor Newman, Professor of Botany, Dr. Gorrie, Soil Erosion Expert, and to Dr. Phillis of the Rubber Research Scheme; and then to our distinguished visitors from overseas in the persons of Dr. Greenslade of Pest Control Ltd., Mr. C. L. Scoles of Plant Protection Ltd., Dr. Dike of Universal Crop Protection, Mr. Jodrell, also of Universal Crop Protection, and to Mr. Bals, and, if there are others with us of whose presence I am as yet unaware, those gentlemen too are included in our welcome.

Especially do we appreciate the presence of those of you who have travelled long distances. Your presence with us adds much to the importance of the occasion, and I trust that later you will not hesitate to contribute to the discussion.

The last conference — the eighth — was held in Kandy in January, 1949. It has been our custom to hold these conferences biennially, but this conference has been brought forward by the importance of the ravages caused by blister blight in the districts subject thereto. I hope the considerable effort made by the Tea Research Institute in recent months will enable the Director and his staff to recommend protective measures, which will enable us to control the pest to a material extent in the year or years to come. It is for this reason that the date of this conference has been advanced, and so that those responsible for the management of estates may be enabled to provide for protective measures in their estimates for 1951.

I now declare this ninth conference of the Tea Research Institute of Ceylon duly open and call on the Director to initiate the proceedings.

NOTE.

The papers published in *Tea Quarterly*, Vol. XXI, Part IV (December 1950), followed the Chairman's opening address.

SUMMARY OF DISCUSSIONS ON THE PROCEEDINGS OF THE FIRST DAY.

Prepared by

T. E. Walter

CROP PROTECTION DURING RECOVERY FROM PRUNING

G. B. PORTSMOUTH,

(Tea Quarterly, Volume XXI, Part IV, page 11).

Mr. H. S. Hurst asked exactly what was meant by "dry weather recovery" and whether this term was applicable to fields pruned in October (in S.W. monsoon districts).

Mr. Portsmouth said that by this was meant that definite dry weather conditions would be experienced during the majority of the period of recovery. Thus although no danger was to be anticipated from "pruning into the dry weather" during October and November in the S.W. monsoon districts, normally the programme in these areas was not completed till the end of December, owing to the usual difficulty of labour allocation, and fields pruned at this time would be subject to long periods of dry weather during recovery. With crop protection, the pruning season could be safely extended, and on St. Coombs estate for instance, half the pruning programme will be done for dry weather recovery and the other half will be done in the S.W. monsoon with spray protection.

In reply to a question by Mr. Zair, Mr. Portsmouth stated that the Tea Research Institute had now reached the stage at which they could recommend normal S.W. monsoon pruning provided that spray protection was undertaken.

The Director added that it was essential, in reverting to S.W. monsoon pruning, to make the change over gradually; large scale spray protection should not be attempted in the first year, but as experience was gained with organisation and supervision, the acreage to be protected could be increased.

Mr. Wallace wanted to know if the practice of piling prunings on to the tea to prevent sun scorch had been tried.

Mr. Thambipillai thought this was impracticable as most of the prunings would be removed by the labourers, in the course of which they would break off most of the new buds.

Mr. Portsmouth replied that the practice of piling prunings on to tea bushes to prevent sun scorch had been practised for a long time in N. India, but more information could not be given until the results from our experiments with the method on St. Coombs were available. It was conceded that the labourers would probably remove some of the prunings from the bushes but if the prunings were kept on as long as possible, it would afford a reasonable degree of protection.

Mr. Northway asked if dadaps should be lopped at pruning time.

Mr. Portsmouth replied that green manure trees such as dadaps and other shade trees should not be lopped at pruning time on areas pruned into the dry weather, recovery is noticeably better on those areas where the stand of shade is good.

In answer to question on the type of equipment used on Kataboola, Mr. Portsmouth stated that on Kataboola and other experiments the 'Four Oaks' pressure rataining knapsacks, with central charge pumps, had been used; there were never more than 35 in operation at one time on Kataboola.

Mr. R. M. Stewart and Mr. K. Morford asked what action had been taken to ensure that adequate supplies of equipment and fungicides would be available for the next S.W. monsoon.

Mr. Portsmouth replied that he was not yet in a position to state whether adequate supplies would be available, but various commercial interests were taking this question up with the Agency Section of the Planters' Association.

(The Director subsequently gave a detailed account of the supply position of spray equipment, see page 14).

Mr. W. A. Young asked if it had been necessary to take on extra labour on Kataboola for the 200-acre spraying experiment.

Mr. R. S. Davies (Bousteads) enquired on which scale of wages the costs/acre for the Kataboola experiment had been based.

Mr. Portsmouth replied that although the labour force on Kataboola was comparatively small (1.05 labourers/acre) it had not been necessary to take on any extra labour for this experiment, but various routine estate operations had had to be postponed. The figures given of costs referred to the old scale of wages, based on pruners' rates; it would probably be necessary to pay for all spraying at pruners' rates.

In answer to several questions on dry weather forking, Mr. Portsmouth stated that forking either immediately before on during the dry weather is most undesirable; on St. Coombs no forking is being undertaken during January — April (the exact period depending on the weather).

Mr. Baker asked whether a suitable pruning height could be recommended and mentioned that in Java it was apparently the practice to leave a "centre lung" (rather than a rim-lung) to provide some protection from the sun for the pruned branches.

Mr. Portsmouth replied that the question of the height and type of pruning to be recommended was a big one, but in general pruning in Ceylon had been too low; in S. India and Java pruning is usually done at 20" — 24", and our pruning height should be gradually increased to this level.

Mr. K. Morford asked what type of tipping had been carried out on Kataboola; he had noticed at the demonstration there that most of the leaves were mature.

Mr. Portsmouth replied that most of the area seen at the demonstration would normally have been tipped much earlier. Tipping had been postponed for the purpose of the demonstration.

Mr. J. MacMahon enquired whether Mr. Portsmouth's paper would be published in the press.

Mr. Portsmouth replied that copies of all the papers to be read at the Conference had been forwarded to the Press, and it was hoped that they would be published in due course.

Mr. Pelham-Roberts asked what date pruning had been started in the Uda Radella experiment.

Mr. Portsmouth stated that pruning had started at the end of August 1949.

The Director stated, in answer to a question on the subject, that there was no danger that constant spraying with copper fungicides would have any detrimental effect on the soil or soil organisms; copper is not a particularly toxic substance, and it is used intensively for spraying in green houses where the resultant comparatively large copper deposits have no adverse effect.

Before closing the discussion on this paper, the Chairman read a letter from Mr. B. D. Garnier in which he recorded his appreciation of the guidance and help he had received from the Director and officers of the Tea Research Institute in the Kataboola experiment, with them he linked the name of Mr. Scoles who had been responsible for the supervision of this pioneer experiment on a commercial scale and whose wide experience of this type of work had been invaluable.

He was sure that all who had seen the Kataboola demonstration would agree that the experiment had proved that tea pruned during the south west monsoon could be efficiently protected from blister blight damage by spraying, even under the most adverse conditions; the standard of recovery on these experimental fields in fact had been equal to that in the pre-blister blight era

Mr. Garnier concluded his letter by expressing his deep disappointment that illness prevented him from being present at the Conference.

The Chairman then expressed his thanks to the Directors of the Consolidated Tea Estates Co., Ltd., for allowing Kataboola estate to be used for this experiment, and to Mr. Garnier for the very extensive part he himself had taken in the experiment; the success of the experiment was due largely to his initiative and energy.

He took the opportunity here of thanking the Directors and the Superintendents of the eleven other estates in the Dimbula districts who had undertaken spraying experiments under the direction of the T.R.I.

CROP PROTECTION DURING PLUCKING—C. A. LOOS.
(Tea Quarterly, Volume XXI, Part IV, Page 16.)

Loss of Crop owing to blister blight. Mr. A. T. Sydney Smith said that in Up-country districts the amount of crop lost owing to blister blight was apt to be underestimated, and the figure of 15—20% given by Mr. Newton for loss in this respect was unrealistic; the figures quoted by Mr. Loos confirmed his impression that the loss of crop in the badly affected areas during peak periods was actually, about 80%, giving an annual loss of approximately 30%.

Systemic fungicides. In answer to a question on this subject, the Director said that whilst it was unlikely that a systemic fungicide would become available in the very near future, the possibility of developing one was not remote; if success were achieved the fungicide would be absorbed into the system of the bush and immunise it for a considerable period.

In reply to a question by Dr. Pfaeltzer on spraying intervals, Mr. Loos stated that on Kataboola the 10-day spraying intervals might have been too long, and on bad blister blight areas spraying would probably have to be done at 7-day intervals. The intervals between spraying and plucking must, however, be as long as possible to keep copper residues at a low level.

Mr. L. B. de Mel asked whether the soil conditions in the control and sprayed plots in the loss of crop experiment were identical and whether the plots had been pruned at the same time.

The Director assured him that conditions of these plots were as equable as possible, and no variations in soil or the time of pruning could account for the considerable differences in yield between the sprayed and control plots.

Mr. Reith expressed doubts from his observations at the Kataboola demonstration that plucking could have taken place regularly at 7-day rounds.

Mr. Loos replied that the 7-day rounds had been rigidly adhered to and only flush which had developed a bud and two fully opened leaves above the small fish was taken as crop. The experiment was under the direct supervision of Mr. Garnier, an experienced planter.

Mr. Gatehouse expressed concern lest the increased use of insecticides in crop protection might do more harm than good by killing not only the pests for which they are intended, but also the parasites which are predatory on them, and asked whether the recent abnormal increase of yellow mite on Kataboola during the wet weather could be attributed to this cause.

The Director pointed out, with regard to the general question, that there is a fundamental difference between fungicides and insecticides; moreover, there are no natural parasites of the blister blight fungus, and as insects are not very susceptible to copper, there was no cause for alarm that the "balance of nature" might be upset by spraying copper fungicides on a large scale.

Concerning the yellow mite attack on Kataboola, this was not confined to the sprayed areas, but had been noticed on many estates throughout the Dimbula district. Means of dealing with this outbreak — including natural parasites — were being actively considered, and he hoped that normally the mite would only be a dry weather pest. Two successive years of exceptional drought had undoubtedly enabled mite populations to build up to an unusual extent.

THE CONTROL OF SHADE—T. E. WALTER.
(Tea Quarterly, Volume XXI, Part I, Page 35.)

Dr. R. M. Gorrie, (Government Soil Conservation Officer). Dr. Gorrie said that there were a few points in this paper that he wished to emphasise. Firstly, concerning the value of shade trees from the point of view of soil erosion and water conservation, their roots are of particular value in preventing sub-soil movement on areas where there is sheet rock only a few feet below ground, and water absorption into the deeper layers of the sub-soil and the rock itself is facilitated by both dead and live roots.

He went on to say that the advice given in this paper should be linked up with the Government's reafforestation policy, the maintenance of a balance of nature as near as possible to that found in natural forest conditions was of particular importance in the large scale growing of artificial crops such as tea and shade trees would go far towards restoring this natural balance. He further suggested — with special reference to estates at higher elevations — the afforestation of marginal areas such as natural water channels in unstable ground and areas which are not sufficientlly productive to be an economical proposition for tea.

In conclusion he referred to the difficulty estates had in getting supplies of tree seed and suggested the establishment of an organisation to look after planters' interests in terms of seed suppplies, advice on selection of species and of the management of the plantations and nurseries.

Mr. A. E. Q. Helling asked how the increase in yields due to shade as demonstrated at Tocklai could be co-related to other experimental evidence from Tocklai that yield responses to nitrogen were considerably reduced by shade.

The Director said he had seen the experiments referred to at Tocklai, and explained that the anomalous result was due to a confusion between the response to nitrogen in the form of leaf droppings from the Albizzias, which provided the shade, and nitrogen added artificially. Under heavy shade from these leguminous trees the response to nitrogen added artifically decreased, but this was to be expected in view of the correspondingly great increase in nitrogen added in the form of leaf droppings, amounting to as much as 1 lb. nitrogen per tree per annum.

Mr. Helling enquired about the effect of shade trees on soil moisture and referred to the practice of planting gums in swamps to reduce moisture.

Mr. Walter said that a reduction of soil moisture in the surface layers of the soil due to transpiration was inevitable with all species of shade trees, and for this reason it might be desirable in districts subject to long periods of drought to lop shade trees at the beginning of the dry weather (lopping at the beginning of the monsoon being purely a blister blight palliative).

Mr. Helling said that he doubted whether a 10-year rotation for Albizzias would be long enough to produce timber of adequate size for tea chests.

Mr. Walter said that the rotation would have to be adjusted according to elevation and local conditions, and that he had based the figure of ten years on low and mid-country conditions. The actual rotation adopted was immaterial (within fairly wide limits) since shade trees were not grown primarily for timber and the question of getting quick returns did not arise.

Mr. K. Morford asked whether Albizzias should be considered largely in terms of their contributions in leaf-fall or from the purely utilitarian aspect of firewood and timber production.

Mr. Walter said that from the tea planters' point of view their leaf-fall and shade contributions were of prime importance ; their utilitarian value could not, however, be ignored and it was with the object to co-relating these two aspects that he had suggested an uneven-aged stand with as short a rotation as possible.

In answer to a further question from Mr. Morford, Mr. Walter said that in referring to "other species" of shade trees he had not intended to imply that he recommended introducing species of shade trees other than those commonly grown in Ceylon.

Mr. McConnel asked whether Hakea saligna would be a suitable shade tree.

Mr. Walter said that judging from the appearance of the few specimens on St. Coombs, it was most unlikely ; these trees had a dense mass of branches which cast an almost impenetrable shade, and had a thin canopy of small leathery leaves.

Mr. MacMahon enquired about leaf diseases of Albizzias.

Mr. Loos replied that Albizzias were usually only subject to leaf diseases in the nursery, and that disease incidence was less if seedlings were grown under shade.

Mr. Davidson suggested that shade trees hindered the manouvering of cables and lances when spraying.

Mr. Portsmouth agreed that this was inevitable and pointed out that bush green manures were equally awkward especially if long spraying lances are used.

The Director added that on the other hand shade trees are a distinct advantage in dusting and mist-blowing, since they stop the dust or mist from drifting away.

Mr. Groves pointed out that a feathery type of light high shade was the ideal for reducing the incidence of blister blight to a minimum.

THE KATABOOLA LOSS OF CROP EXPERIMENT. — C. A. LOOS

(Tea Quarterly, Volume XXI, Part IV, Page 38.)

Mr. Power asked whether the figures quoted for this experiment included the resting period.

Mr. Portsmouth replied in the negative, explaining that the figures were in respect of hard plucking compared to normal plucking; the temporary increase obtained from hard plucking might be neutralised during the resting period.

GENERAL CONSIDERATIONS — G. B. PORTSMOUTH.

(Tea Quarterly, Volume XXI, Part IV, Page 41.)

Plucking System. In answer to a question by Mr. Glen Dicken, Mr. Portsmouth explained that it was not possible to say exactly what was meant by "adequate foliage leaf," but our recommendations in this respect were based on general principles arising out of the usual system practised in Ceylon of taking two leaves and a bud and leaving one leaf for the bush. Our plucking system had been standardised as far as possible, and from this point of view it compared favourably with the numerous variations in technique practised in some other countries.

Hard Plucking. (i) In reply to a question by Mr. Thambapillai, Mr. Portsmouth said that experiments had shown that hard plucking leads eventually to a decline in yield. Consequently, it was essential that bushes which had been fish leaf plucked during severe blister attacks should be rested for three to four weeks to make up the loss of foliage and then plucked normally.

(ii) Mr. G. K. Newton added that he hoped that the recommendation that fish leaf plucking should be adopted for short periods, followed by resting and normal plucking, would not lead to excessive over-plucking, owing to the difficulty of persuading labourers to pluck normally having once been allowed to strip the bushes.

Manuring and Resting. *Mr. E. G. Groves asked whether the Assam practice of manuring bushes at the start of their resting period should be followed.*

Mr. Portsmouth replied that rested fields should be manured and given spray protection if necessary, to ensure that the bushes derived the maximum benefit from the resting period.

The Director added that experimental evidence would be available shortly as to whether the technique of resting stripped fields for 3 — 4 weeks (with manuring) was adequate.

Disease resistance. In reply to several questions on this subject, Mr. Portsmouth stated that the actual mechanism of disease resistance by which some clones were resistant to blister blight was a problem which had as yet received no satisfactory answer ; it was possible, however, that it was a question of the leaves of certain clones developing an abnormally thick cuticle at an early stage.

Dr. Phillis (Director, Rubber Research Scheme) added that this supposition appeared to be borne out in the case of certain rubber clones which were resistant to oidium.

Replanting policy. In reply to a question by Mr. Davis, Mr. Portsmouth said that there was no reason to fear that clonal material selected for special qualities such as disease resistance and high yields would not retain those characteristics indefinitely.

The Director added that it was essential to select bushes for vigour during bad blister blight attacks rather than primarily for immunity to blister blight ; on St. Coombs some of the high yielding clones selected in pre-blister blight days had now been abandoned, but others selected at the same time which happened to be less susceptible to blister blight were still conspicuous. Further, a replanting programme for St. Coombs had been planned, at a rate of 6 acres per year for the next ten years, this included the important preliminary process of reconditioning the soil by growing of grasses on these areas for one year.

Green Manures. *Mr. K. Morford stated that if the ideal of producing large bush frames were attained, it would be difficult to follow the established practice of sowing bush manures after pruning.*

Mr. Portsmouth replied that cover crops would not be necessary if the frames of the tea bushes were large enough and referred to old adage that the "best cover for tea soils is tea."

Mosses and ferns. (i) In reply to a question by Mr. K. Morford, Mr. Portsmouth stated that the present increase in the incidence of mosses and ferns could be attributed to some extent to the bushes being debilitated by blister blight.

(ii) *Mr. C. de Lemos asked whether the careful removal of ferns and mosses would do more harm than clean pruning, if the light type of pruning were adopted.*

Mr. Portsmouth replied that the removal of ferns and mosses was of less importance than increasing the size of the bush frames by light pruning.

(iii) The Director added that experiments were now in progress on the eradication of mosses and ferns by various chemicals.

Weeds. Mr. K. Morford observed (and Mr. Portsmouth fully agreed) that allowing a cover of weeds definitely increased the incidence of blister blight.

MISCELLANEOUS PAPERS.

(The Institute does not necessarily endorse the views expressed in these papers or agree with figures quoted).

Dusting — Dr. H. Dike. Dr. Dike said that effective control of blister blight by dusting under Ceylon conditions had been made possible by the recent modification of an existing dusting machine to impart a rolling motion to the dust clouds, and by the development of "Cuprosana" dust. The Whirlwind Duster, which incorporated these developments, was normally mounted on a trailer or jeep, but mobility on all average estate paths could be obtained by mounting it on a trolley — a prototype of which had a total width of only 2' 6" and which could also be carried on level ground by 4 labourers. The tests he had carried out with his machine in Ceylon showed that it was possible to dust at least 30 acres per hour, and innumerable leaf analyses had shown that a good even coverage was possible in all the climatic conditions experienced in the S.W. monsoon.

In comparison of the expenses involved in dusting and spraying any particular area, he referred to the great saving in labour which dusting allowed (4 — 6 men compared with 100 — 150 men for spraying). Moreover, the initial capital outlay for dusting was only 25% of that required for spraying, and costs of application for both methods were approximately the same; experiments showed that the initial cost of the dusting machine would be covered by the increase in yield which could be expected from dusting an area of 15 acres of tea, 7 months from pruning, over a period of 4 months. As further advantages, he pointed out that organisation was simplified by the fact that dusting did not require water haulage, and supervision was reduced to a minimum by the simple technique involved and the great distance carried by the dust in one operation (up to 400 — 500 yards in a high wind).

Dusting technique could not, however, be mastered in a day, and he advised estates intending to dust to gain preliminary experience by dusting small areas before embarking on their full programme. He concluded by giving an assurance that he was still actively studying dusting problems, and that the Whirlwind Duster would be further developed.

The Castlereagh Dusting Experiment — V. C. Baker. Mr. Baker, in giving his impressions of his dusting experiment on Castlereagh from the planter's (rather than the scientist's) point of view, explained that 5 plots had been laid out, at stages in the pruning cycle, varying from 6 months to 3 years from pruning. During the S.W. monsoon it had been found possible to dust these plots in identical fashion each week, making use of the prevailing wind currents, and although 100% efficiency had not of course been achieved, the degree of coverage had been adequate for all practical purposes; this was proved by the very vigorous growth of the flush, and the absence of blisters and stem infections in the dusted areas. He had been very favourably impressed by the intelligence and keenness shown on the part of the labourers operating the machine, who regarded it as an enviable job; with spraying, on the other hand, the labourers might not be so keen on doing this monotonous job thoroughly once the novelty had worn off, and the results obtained experimentally might not be borne out in practice over long periods of routine field work.

For these reasons, therefore, and as the Superintendent responsible, he would favour protection by dusting rather than by spraying.

The Director added that the Institute did not dispute the fact that under typical S.W. monsoon conditions distribution of the dust was straightforward, but in the N.E. monsoon with its clear sunny mornings the dust tended to drift upwards ; our present solution of this difficuty was to start dusting at dawn and use the downward convection currents.

He summed up by emphasising that the Institute does not advise taking large scale risks with dusting, especially with tea recovering from pruning.

A trolly for estate paths. *Mr. K. Morford asked whether adequate attention was being paid by the Engineering Department of the Tea Research Institute to the question of developing a really adaptable trolley for use on estate paths (as opposed to the more expensive alternative of adapting the estate paths).*

The Director said that the T.R.I. Engineer had in fact been responsible for developing a trolley for use with Dr. Dike's dusting machine. Further, he was hopeful that a new type of light Market Gardening Tractor developed in the U.K. might prove satisfactory, and he was considering asking the Board's approval to purchase one.

Dyes for dusting. In answer to a question by Mr. McConnel, Dr. Greenslade said that the possibility of incorporating an intense dye into the dust, which would indicate where the dust is going during the actual dusting operation, was being investigated ; the concentration required was however so small that no assurance could be given that it would be practicable.

Dr. Dike added that the development of a colorimetric system of leaf analysis in the field, sufficiently sensitive for low concentrations of copper, was also being studied.

Dusting Experiments in Uva District. (i) In answer to a question by Mr. Weeks, the Director said that the possibility of carrying out a dusting experiment in the Uva District during the present N.E. monsoon had received careful consideration at an Experimental Sub-Committee meeting attended by various senior planters from Uva. It had, however, been decided that the S.W. monsoon districts had prior claim to attention for the time being, since the tea in these district was steadily deteriorating owing to repeated and prolonged attacks ; in Uva, on the other hand, blister blight attacks were short and sharp, and the tea there was still magnificent by comparison.

There was, however, a distinct possibility that Uva would be the district selected for forthcoming experiments with the dusting and mistblowing machines referred to by Dr. Greenslade and Mr. Bals.

(ii) *Mr. E. G. Edward asked whether dusting would be practicable during the high winds and thick mists which were the typical conditions during December and January in Uva.*

The Director replied that the Castlereagh experiment had shown that dusting in high wind was quite feasible ; rain (apart from torrential showers during which dusting was impossible) was an advantage rather than a handicap in that it tended to settle the dust. Similarly, mist would help to a certain extent, but each estate would have to work out its own plan for working "blind" in dense mist.

Mr. V. C. Baker added that on Castlereagh the best dusting had been done in high wind, with mist and cloud, and under these conditions a copper deposit had been obtained at distances up to 500 yards.

Dusting tea-cum-rubber estates. In answer to a question by Mr. F. de Silva as to whether the same machine could be used for dusting tea and rubber, Dr. Young (Rubber Research Scheme) said that he had used Dr. Dike's Whirlwind Duster for dusting oidium on rubber, and it had proved extremely suitable for this purpose.

Dusting cum-mistblowing. In answer to a question by Major O. L. M. Lebbe on the possibility of devising a machine which could be used for dusting and mistblowing, the Director said that Dr. Dike had developed his machine with this dual purpose in view. He had, however, made more progress with dusting than mistblowing which at this stage was still an open question.

Spraying, Dusting and Mistblowing compared — Dr. R. M. Greenslade — Pest Control Ltd. Dr. Greenslade referred to his original recommendation that spraying was the best solution to the blister blight problem — in fact the only one for 100% control — and he reaffirmed this opinion. He fully realised the drawbacks inherent in spraying, e.g., difficulty with organisation of labour and water supply, and appreciated that dusting or mistblowing was the next best treatment. His firm had developed several types of dusting and mistblowing machines for use on large scale contracts, and he hoped to have these available for trial in Ceylon in the near future ; these included a dusting machine light enough to be carried on estate paths, and a large mistblower with a high output.

Mistblowing — E. J. Bals (E. J. Bals and Partners). Mr. Bals started by outlining some of the inherent advantage in mistblowing as opposed to spraying or dusting ; he emphasised that the mistblower he had developed had so far only been tried in the U.K., where tests had shown that with pure oil as a medium, an application of 1/2 a pint per acre gave a peposit of 200 — 400 droplets per square inch over a range of 80 yards ; under ideal conditions complete coverage had been obtained up to 120 yards — (the average diameter of the droplets being 1/270th of an inch). He hoped that it would be possible to use an oil emulsion with only 25% non-tainting non-phytotoxic oil, and that the oil component would be of considerable help in fixing the fungicide to the leaf.

He had decided that a portable machine was not practicable and had accordingly developed a self-propelled unit 4 feet wide, weighing approximately 10 cwt. (including 30 gallons of liquid, or enough for 30 to 60 minutes of continuous mistblowing); in the U.K. he had been able to cover 2 — 3 acres a minute with this machine, and he hoped that under Ceylon conditions it would prove possible to cover 100 — 200 acres per day. A prototype of his machine was due to arrive shortly, and the Director of the Tea Research Institute had kindly undertaken to carry out tests with it.

In answer to a question on the availability of oil-based fungicides, the Director said that there were indications that these were available ; some had been tested by the T.R.I. recently, but no further details could be given at the moment.

Copper content problems in connection with dusting and spraying.

1. **Dusting of tea in bearing.** In answer to a question by Mr. E. G. Groves, Mr. Portsmouth stated that the T.R.I. were prepared to advocate dusting of tea in bearing provided that there was no danger of the dust being carried over the areas due for plucking the next day.

The Director added that owing to this difficulty the whole of the plucking programme on Kataboola had had to be recast. Moreover, spells of dry weather during dusting caused some anxiety concerning copper contents, as rain was needed to remove the excess copper (i.e., that above the amount retained by the leaf, which appears to be adequate for protection).

On this question, Dr. Dike added that in the Castlereagh experiment he had found that about 8% of the dust drifted away to areas due for plucking, and samples from these areas showed an average copper content of only 60 parts per million.

2. **Copper tolerance as applicable to the U.S.A. and other countries.** In answer to a question by Mr. Davies on this subject, the Director stated that it was reasonable to expect that the Public Health Authorities in Empire countries would follow the lead given by the Metallic Contamination Sub-Committee of the Ministry of Food in the U.K. in raising the limit of copper tolerance (temporarily) to 150 parts/million.

Dr. Dike stated that enquiries he had made in the U.S.A. had shown that no restriction of copper in tea was enforced in that country.

3. **Smallholders.** *Major O. L. M. Lebbe raised the question of the possibly excessive amounts of copper in leaf sold to bought leaf factories by smallholders, who could not be relied on not to spray their tea just before plucking, or to use excessive amounts of fungicide.*

The Director replied that it was of course impossible to ensure that small holders would not spray their tea just before plucking, but it was hoped to set up an analytical control section which would make routine checks and deal with offenders.

He further pointed out that it would be in the interests of the individual small holders undertaking spray protection to keep their costs of application to a minimum; it was therefore not considered likely that they would increase the concentration of fungicide used, or use excessive quantities of spray fluid. Moreover, since copper is not a poisonous metal, slight increases in the copper content of leaf sold to bought leaf factories need not cause undue concern.

4. **Blending of teas to reduce excessively high copper contents.** Mr. Thambapillai suggested that up-country teas which for some reason or other had an excessively high copper content might be blended with low-country teas to reduce the copper content, and the Director agreed that, with comparatively simple supervision, this would be feasible.

Spray equipment — the supply position. The Director, in giving a brief outline of the supply position regarding spray equipment, stated that some anxiety had been caused by the fact that several metals commonly used in the manufacture of spray equipment had recently doubled in price, and were becoming scarce. He had accordingly instructed the Institute's Engineer, Mr. Landreth, to investigate the problem of how spraying equipment now in common use could best be modified, and he had produced a prototype of a highly simplified type of pressure retaining knapsack sprayer made of mild steel sheet (This equipment which was demonstrated, has a capacity of 5 gallons, and a total weight of 14 lbs. including detachable carrying harness). The container is charged through a Schrader valve on top (through which the pressure can be checked with a tyre gauge) and a light-weight valve assembly is attached to the base of the container by means of the threaded plug fittings from a standard 40 gallon oil drum. The lance is connected to the container by light-weight high pressure hose, obtained locally.

He continued by saying that local manufacturers, besides those in the U.K. and on the continent, had been contacted with a view to large scale manufacture of this equipment; he could give no further information concerning developments at the moment, but he was optimistic about the prospects. He wished to make it clear that he was convinced that the battery type of knapsack equipment is the most suitable type so far developed for large scale wet spraying; though the Institute's experience was limited to the "Four Oaks" equipment he hoped that the "Saval" and "Vermorel" equipment would be available for trial shortly, and that these would improve the supply position.

He concluded by suggesting that those who were interested should register their names with the T.R.I. and they would receive circulars from time to time concerning the fluctuating supply position, and giving full details of suggested modifications regarding nozzles, concentrations, and so on.

MISCELLANEOUS ADDRESSES ON SPRAYING.

1. **A spraying experiment in the S.W. monsoon — G. Thambipillai.** Mr. Thambipillai gave an account of the spraying experiment he had conducted on Feteresso Group on tea recovering from pruning. He had pruned 190 acres between June and October, and has sprayed this area with Perenox and Blitox at 5 day intervals (4 ozs. in 10 gallons water), using a modified type of single lance with "Marvellous" nozzles. He said that it was essential that spraying labourers should be hand-picked and specially trained, and he had improved their standard of work by offering them an increased wage dependent on the results obtained. Spraying costs varied between Rs. 2·30 and Rs. 2·60 per acre per round, depending on the nature of the terrain and the availability of water.

Although the experiment, which had been conducted under the worst possible climatic conditions, had been a complete success, the difficulty remained that the spraying technique as far developed would entail heavy recurring expenditure, and this could only be overcome by development of a systemic fungicide.

2. **A spraying experiment in Uva — R. C. P. Adams, for A. R. Williams.** Mr. Adams read the notes prepared by Mr. Williams describing a spraying experiment on Ragalla Estate, where 571 acres were being sprayed at 10-day intervals. He said that the water supply was a major problem, and though water points had been prepard in ravines with a capacity of about 750 gallons/day, a lorry with drums of water and 7 water carriers was in permanent use. Spraying equipment consisted of 12 battery knapsack sprayers and six Kent knapsack sprayers, each of the former being fitted with 4 ft. beam carrying 4 nozzles (usually Teejet). Each sprayer covered just over 3 acres per day (average) but the gangs were doubled so that work could proceed continuously from 6 a.m. to 1 p.m. The labourers were paid 25 cents extra on each spraying day, and a bonus was to be paid later, depending on the results achieved. Total costs, so far (exclusive of depreciation and spares) varied between Rs. 2·00 and Rs. 2·25 per acre.

While it was still too early to assess the results of this experiment, it had shown that with careful organisation it is quite feasible under normal estate conditions to spray 600 acres in the N.E. monsoon at a cost of Rs. 2 to Rs. 3 per acre.

3. **Impressions of spraying and dusting.** Mr. Sydney Smith, giving reasons for his preference for dusting rather than spraying, said that dusting was done by a

machine which distributed the dust over a large area in a simple operation, involving practically no expenditure on labour. Spraying, on the other hand, was dependent for its success entirely on the human element, and he had grave doubts whether adequate supervision of large scale spraying was possible ; moreover, he felt that difficulties in organisation and availability of labour and water supply had been underestimated, for even assuming that all the extra labour required for spraying was available, the problem remained of how to keep them employed during the six months of the year when not required for spraying ; the vastly increased overheads in respect of various benefits and concessions to their families had also to be considered.

In conclusion, he said that spray protection of whole estates would have to be envisaged, and urged the development of a suitable machine as being the only solution.

The Director, in reply, said he considered Mr. Sydney Smith had been unduly pessimistic, particularly on the question of water supplies. In the Kataboola experiment, cut barrels and bamboos had proved quite adequate, and it had only been necessary to carry water once during the 3 and ½ month period.

He further pointed out that a unit of 200 acres had been chosen for the experiment because it represented the area that would be pruned annually on a 600-acre estate (the average size of estate in the S.W. monsoon districts), and no extra labour had been taken on for the experiment.

(ii) Mr. Groves stated that he had formed the impression from the various papers he had heard that tea recovering from pruning, which required 100% protection, would have to be sprayed, but that for tea in bearing (which did not require 100% protection) dusting was a better proposition.

SMALL HOLDERS

Major O. L. M. Lebbe asked what was being done to assist the small holders, particularly in blister blight control activities.

The Director said that there was a total acreage of some 60,000 acres of small holdings in Ceylon, and that a proportionate amount (approximately 10%) of the T.R.I. income was being spent on a small holders' advisory service consisting of 3 officers. Although these officers were doing everything possible on behalf of small holders, it was fully realised that the service was not adequate ; he pointed out that most of the 60,000 acres of small holdings consist of holdings of less than 1 acre in extent, and he compared the problem of advising these small units with that of advising large estates, for which advice given to a V.A. would cover several thousand acres. Accordingly a plan had been drawn up some months ago for the extension of the service to small holders, and this awaited consideration by the Minister of Agriculture.

With regard to blister blight problems, vis a vis small holders, the Director pointed out that the experimental work being done on blister blight was as equally applicable to small holders as to normal estates. Further, special attention had been given to the Kotmale district, where blister blight and soil erosion were particularly alarming, and an extra officer for that district would in any case be appointed.

Mr. L. B. de Mel added that he was in a position to state that the Board of the T.R.I. was keenly concerned with the interests of the small holders, and that they would do everything possible to help them fight blister blight; he suggested that the Board should contact the Government with a view to obtaining some relief on duties on equipment and so reducing the large costs involved.

In conclusion, he warned against the mistake of putting the cart before the horse, and pointed out that at this stage it was not possible to plan a programme specially for dealing with blister blight on small holdings.

Mr. Unamboowe said that he had been responsible for calling the conference with the Director, in the Kotmale district which had been mentioned, and confirmed that the Director and the Board of the T.R.I. were keenly interested in small holders' problems. He had suggested that a number of demonstration plots should be established and he was very glad to be able to say that the Director had agreed to put the suggestion into practice at the earliest opportunity.

PROCEEDINGS OF THE SECOND DAY

PROGRAMME

10 a.m.	**Tea Manufacture.**	
	1. Quick Withering	— C. R. Webber (Thotulagala Estate).
	2. Common problems in Tea Manufacture	— E. L. Keegel
	Discussion and Break.	
11 a.m.	**Address by His Excellency the Governor-General.**	— (Published in *Tea Quarterly*, Vol. XXI, Part IV (Dec. 1959)
11.20 a.m.	**Mechanical Plucking.**	— B. D. Fay (Dickwella Estate).

NOTE. A detailed account of Mr. Fay's experiments on Dickwella Estate, was published in *Tea Quarterly*, Volume XXI, Parts II/III, (combined), page 38. This number of the *Tea Quarterly* was not issued until after the Conference and it is unnecessary to reproduce Mr. Fay's paper in this number.

12 Noon	**Pathological Problems.**	— C. A. Loos.
12.30 p.m.	**The Work of the Institute.**	— The Director.
12.40 p.m.	**Open Discussion.**	

TEA MANUFACTURE

PART I. QUICK WITHERING.

by

C. R. Webber.

(Thotulagalla Estate, Hoputale).

Before starting on this paper on quick withering there are two points I would like to make clear. One is that I am not yet, at any rate, an expert on my subject. I have been working consistently and practically at it for nearly two years but do not feel competent as yet to lay down the law. I can only tell you briefly what I have done to-date, give you some of my opinions for what they are worth and rather leave you to draw your own conclusions. My second point is this. We all know that there is nothing new under the sun and quick witherering is no exception. I think I am correct in saying that the principle was tried out as long as fifty years ago.

I shall refer hereafter to normal and quick teas for want of better terms. Normal teas are those made from leaf withered by means of tats and quick teas are those made from leaf withered by means of the withering machine.

The machine I have been using known as the Benison Colombo Commercial Company Withering Unit, consists of a drum mounted on a central shaft, a cased fan which delivers air to the longitudinal section of the drum through an expansion piece and a vertical circular trunk coupled to the suction eye of the fan. This particular machine can deal with 750 lbs. of green leaf at a time. The leaf is loaded into the drum which is made of wire mesh of about No. 4 size and which revolves at 6 r.p.m. Heated air is drawn through the vertical trunk from the exhausts of two tea driers situated immediately below the machine and is then passed through the expansion piece and over the leaf. The fan speed is 365 r.p.m., approximately 12,000 cubic feet of heated air are required per minute and 4.4 h.p. are needed to operate the machine.

It was obvious from the beginning that obtaining the heated air from the drier exhausts was not going to prove satisfactory. It is impossible by this means to procure air of a constant temperature unless it can be arranged that withering shall be done at a time when no firing of teas is in progress. Temperatures of heated air before passing over the leaf can be obtained as high as 135°F. but once firing of teas commences the temperature will drop down to 100°F. or lower. At 135°F. I have obtained withers in under two hours, but at 95°F.—100°F. it takes anything up to four hours or a little longer. Efforts are being made now to develop a furnace capable of supplying heated air to machines of this type at a reasonable cost. Something in the nature of the type of furnace used in the direct firing of teas is envisaged. Given the necessary heated air at a sufficiently high temperature there is nothing to prevent leaf being withered consistently in two hours. This

being the case, and given sufficient machines, there is no reason why factories should not be run entirely with these machines subject, possibly to slight staggering in times of weighing leaf so that the output of withered leaf would be commensurate with roller and drier capacities. I do not think it would be out of place to mention here that withering quickly at high temperatures appears, as far as my experience goes, to have no adverse effect on the finished teas.

In the event of a factory being equipped with withering machinery instead of tats the question arises what would be done with the final batch of leaf that must come into the factory between 5 p.m. and 6 p.m.? If it is considered undesirable to continue manufacture at night, the evening leaf may be spread thickly in a cool place and carried over till morning. Many batches of leaf have been so treated in my factory. So far tea made from leaf treated in this way has held its own very well in comparison with leaf withered direct from the field or even withered in the orthodox manner. I must admit, however, that on occasions the results of this type of treatment have been a little disappointing. I have recently been given to understand that I had been spreading too thickly the leaf retained over-night. For the last month I have been spreading it far more thinly (about 6 inches) and am expecting better results. I have despatched an invoice to Colombo manufactured in this way but it is not due to be sold till the week after next.

During nearly two years work over 400 separate batches of leaf have been manufactured and results have been both interesting and encouraging. For the first year I confined myself to sending samples of individual experiments or samples of several experiments bulked together for reports and valuations. All samples were, and are, sent to Brokers in Colombo and London under code numbers and tasted "blind." Each batch of samples has included some of normal teas for purposes of comparison. At first results were most discouraging as normal teas were given preference with almost monotonous regularity. This was understandable as for some time I did not really understand the machine and, amongst other mistakes, wither percentages varied alarmingly. In addition I think most of you will agree that the value of samples of individual experiments of any kind is not very considerable. However, as time went on and I became more conversant with the machine there was a gradual trend in favour of quick teas. Since February this year quick teas have been sold on the Colombo market. Comparative invoices of normal and quick teas have been despatched at the same time and sold in the same catalogue. So far I have confined myself to making only B.O.P. by means of the withering machine as it takes too long to collect sufficient of other grades of which I only make small percentages. Up-to-date the average price I have obtained for normal teas has been Rs. 2/68½ per lb. and for quick teas Rs. 2/66¼ per lb. (I am only referring here to the comparative invoices). From February to July I averaged a better price for quick teas (one invoice fetching as much as 13 cents per pound more than its normal counterpart) but during July, August and September they showed a decline. This latter period is the time during which we make quality teas in Uva where my factory is situated. One school of thought is that the rather drastic treatment to which the leaf is submitted in the withering machine may destroy some quality in good teas and bring out some quality which poorer teas lack. There would appear to be some foundation for this theory as the quick teas have been on the upward grade again since September, one invoice beating its normal competitor by the comfortable margin of 13 cents per lb. If that upward tendency is maintained from now until February the quick teas will probably average a better price over the twelve months than the normal teas. If this turns out to be the case I consider that the principle of quick withering can be said to be proved. It will then be up to experts to devise machines better than the one I am using now and to bring out furnaces capable of giving economically the required amount of heated air. Suppose on the other hand that quick teas prove about equal to normal teas. The

question then is what benefits are to be gained by giving up the orthodox method of withering? I do not anticipate that the cost of running withering machines fitted with individual furnaces would show any appreciable saving on normal withering costs, in fact it might run out a little dearer. Where savings would be effected would be in original factory construction, insurance premia on such factories, tat renewals (no small item at present), factory painting and upkeep, etc. I also envisage a machine such as the one in my factory being a most suitable substitute for an extra bay or bays required for an existing factory.

Just one word about the appearance of quick withered teas. I do not think it comes up to that of normal teas being inclined to be a little "choppy" and rather less black. This difference, however, is not sufficiently great to call forth adverse comment from the Brokers. The appearance of the withered leaf when discharged from the drum is nothing short of appalling when judged by normal standards. After 5 minutes in the roller the leaf reverts to normal as far as appearance is concerned and dhool percentages, etc., work out almost exactly the same as in orthodox manufacture.

That in a nutshell is my experience of quick withering.

TEA MANUFACTURE

PART II. COMMON PROBLEMS IN TEA MANUFACTURE

By

E. L. Keegel

Withering.

In the course of my advisory work I have frequently come across instances where despite the best withering facilities and plenty of tat space, under-withered leaf was being fed into the rollers. Attempts to reduce costs are often responsible for soft withers, but when it is realized that this surplus moisture has ultimately to be driven off in the driers, thus lengthening the working day, there is really not much to be said in favour of very soft withers. Even with extra care in rolling it is doubtful whether a satisfactory product will ever be obtained.

The shutting up of all loft windows at night, especially when the fans are stopped, is still practised without a knowledge of the harmful consequences. Withering leaf breathes and if the carbon dioxide gas is not allowed to escape it has an injurious effect on the leaf almost akin to keeping it in a closed basket. I am almost certain from all evidence available that this is one of the main contributory causes of dull infusions and "sweaty" liquors.

The temperature at which leaf should be withered is still a much discussed question. Admittedly on the data at one's disposal, both practical and theoretical, there is a considerable risk in employing a high temperature for withering, particularly if it is maintained too long. It may interest you to learn that no detrimental effects will result if leaf is subject to a temperature even as high as 220°F. for a few seconds only. However, if exposed for a minute at this high temperature the leaf is completely killed and will not ferment. At lower temperatures, but considerably higher than those adopted in practice, it was observed that at 160°F. exposure of leaf for even 5 minutes was sufficient to stop fermentation. For shorter periods than 5 minutes fermentation was adversely affected. Other experiments carried out on high temperatures revealed that no damage resulted from the employment of temperatures of 100 — 110°F. for

periods as long as 2 hours. Fermentation was quite normal, which explains why Mr. Webber has obtained such satisfactory results with his machine. In the light of the results of all these experiments it appears that the length of time during which a high temperature is maintained is what matters most. Long hours of withering at over 90°F. are known to redden the leaf. I have not found much evidence of very high temperatures being used for withering but the reddening of leaf I have seen on a few occasions was more due to heaping of the leaf for unduly long periods. This invariably occurred in factories where organisation was faulty and labour costs were cut. Though great care was exercised in the withering process the overlooking of a trifling matter like this nullified many of the advantages that would have accrued from the observance of low temperatures and even spreading.

Rolling.

Now that I have referred to leaf temperatures, it may be as well to see its relation to rolling. The idea that "Heat is the enemy of quality" seems to have been engraved in the minds of most planters. Time and again have I seen leaf being under-rolled just because it was too warm to the hand. To my mind some heat in the roller is a healthy sign. It shows that work is being done on the leaf. So long as the leaf is freely circulating there is nothing to fear from apparent over-heating and fortunately the roller itself comes to your aid in this matter. If too much pressure is applied the upper layers become caked which will be a signal that you have exceeded the limit. The real danger of heat actually arises under this condition which more often than not is a result of over-charging the roller. The danger of keeping rolled leaf lying about for any length of time must also not be overlooked. If this is a regular feature in your factory then obviously your organisation is a fault. It is far better to keep that leaf jogging along in your roller than discharging it just because it has had, say, a 30 minute roll.

This brings me to the length of time for which pressure should be applied, The variety of pressure periods I meet with from factory to factory is simply bewildering — 5 minutes on 5 off, 7 on 3 off, 4 on 3 off, 8 on 2 off and even 2½ on 2½ off. On investigation I generally find that there is no special reason for adhering to any particular combination. It merely happens to be a tea-maker's fancy. Obviously the idea behind all this is to cool the leaf but you will probably agree with me that this must be intelligently applied. Provided that the leaf is circulating properly there does not appear to be any justification for raising the pressure cap at all. The actual cooling effect observed in the commercial rollers at St. Coombs by raising the cap every 5 minutes in a 30 minute roll was only 2° so long as the leaf was circulating under pressure. From the point of view of breaking up the balls the raising of the pressure cap is certainly of great help, but why overdo it? Release of pressure about the middle of a roll for a few minutes and again at the end is quite sufficient. It is prolonged rolling at high temperatures that has a detrimental effect. A general rule that may be wisely adopted is, therefore, short rolls if heavy rolling is the objective and long rolls in association with light rolling. If fermentation periods are accordingly adjusted the ultimate result is more or less the same.

Before I turn to the question of duration of rolls, number of rolls and dhool outturns — matters that puzzle many planters — I wish to touch briefly on an equally perplexing problem, namely, roller charges. Makers' ratings have been followed sometimes with disastrous results. The size of a roller is not the main governing factor, the most important being the design of the table and most particularly the design of the central portion. With most tables a simple *true cone* fixed on the door will ensure adequate circulation even under moderate pressure. Details of the fittings have been given in our publications and I will not enlarge on this subject beyond warning you not to confuse these *true cones* with fittings which are used in Epicyclic Pressure or E. P. rolling. The degree of wither has to be taken into consideration as well; let me give

you an example. Supposing the optimum charge for a roller is 400 lbs. for a soft wither (40% outturn made tea to withered leaf), a simple calculation will show you that it contains about 240 lbs. of water and 160 lbs. of dry matter. The water in the leaf occupies no extra space of course. Now, if you have hard-withered leaf corresponding to an outturn of made tea of 50% and do not wish to overload that roller the charge must not exceed 320 lbs. Note carefully the difference in the optimum charges. It is as much as 80 lbs. although in both cases the volume taken up by the leaf is the same. Having seen hundreds of rollers of all sizes and all makes in action I am convinced that half the trouble experienced in rolling is caused by over-charging. True, it may appear uneconomic to under-charge rollers but you may rest assured that in the long run it will pay not to over-charge. The optimum charges of withered leaf I would recommend for the more familiar rollers are as follows:—

44 ins.	... ...	400 lbs. withered leaf.
40 ins.	... ...	350 „ „ „
36 ins. (Deep jacket)	...	300 „ „ „
36 ins. (Standard jacket)	...	250 „ „ „
34 ins.	... ...	225 „ „ „
32 ins. (Square jacket)	...	250 „ „ „
35 ins. (Economic)	...	300 „ „ „
32 ins. „	... ...	250 „ „ „
28 ins. „	... ...	125 „ „ „

increase by 10% for *rolled* leaf.

These figures are based on normal withers. If you go in for abnormal withers, very soft or very hard, add or deduct 10%. When rolled leaf is to be charged the amounts may be increased by 10%.

Turning to the question of duration of rolls I have this to say: Do not be tied down to the orthodox 30 minutes. Your machinery must decide this for you and this is where organization comes in, a subject which is far too wide to talk to you about now. In some factories, smooth working is sacrificed for the sake of following orthodox methods not realizing that a slight shortening or lengthening of a roll makes no material difference to the result. Dhool outturns must similarly depend on your machinery and this applies to the number of rolls as well. The logical amount of dhool to be taken out in a four roll programme appears to be 10, 20, 25 and 30% but what of it if you instead, take 40% in the third roll and only 15% in the last? There will be practically no difference provided the big bulk outturn is the same. This may sound illogical, but if you doubt me try an experiment out with the same leaf and on the same roller and see what you get.

As I said earlier, the sizes of your rollers are the chief influencing factor in deciding on how much dhool should be removed from a roller. If we take an extreme case where, say, 400 lbs. is charged into a 40 ins. roller, the leaf from which has to go into a 32 ins. for the next roll, surely it will be the height of folly to take only 20% dhool just because orthodoxy demands it. At least 30% of that leaf will have to be extracted as dhool to give satisfactory results in the following roller. I hope you see the point I am driving at, which in a nutshell is this; do not bother yourself with how much dhool is taken; concern yourself more with how much leaf should go into a roller. In other words, first fix the charges in relation to the sizes of your rollers and the order in which they are to be used, then dhool outturns should adjust themselves. And speaking of dhool outturns do not blame your roller if you sometimes get inadequate dhool. A loose belt in the dry weather can quite easily be the cause.

The speed at which a roller should run is another of those things which confuse most people. There is more than sufficient evidence to show that speed has very little effect on the teas produced. In general it may be said that a

slow speed improves appearance slightly, but if it is below 30 r.p.m. poor circulation of the leaf will result. Experience shows that speeds of over 50 r.p.m. are wasteful of power and that the factor of importance is the crank-throw. As a guiding principle you may take it that if the crank on a roller is small the speed should be high and vice-versa. In practice it will be found that speeds of 35-40 r.p.m. need not be exceeded but if a roller is over-charged or has no contrivance, such as a cone, on the door it will be found necessary to increase its speed to 50 r.p.m, to get the leaf to circulate properly. Most modern rollers are provided with relatively big cranks which assist the circulation of leaf and, therefore, need not be run at more than 40 r.p.m. The whole question really boils down to this; adopt a speed that will circulate the leaf briskly; that is all. It does not matter whether the roller runs at 30 or 40 or 50 r.p.m. but do not forget that faster rolling consumes more power.

Another question frequently asked is how long must leaf be fermented and in what order should dhools be fired. The most favourable point to be reached in fermentation is to my mind the most difficult task in the process of manufacture. Should one be guided by colour or by nose? There is at present little precise information on this point, but some preliminary work has brought me to a stage where I can lay down certain broad generalizations. To judge the progress of fermentation by colour is very misleading indeed because if the wither is hard the leaf will look green no matter how long it is left on the fermenting racks and if the wither is soft it quickly acquires a coppery hue. Aroma on the other hand is a safer guide but experience is needed to distinguish what some old planters will describe as first nose, second nose and third nose. If you can do this you will have no doubts about your fermentation.

Roll-Breaking.

Roll breaking is one branch of manufacture where no serious attempt has yet been made at standardization. The reason is not far to seek because there is such a variety of machines on the market working on different principles. In consequence it is not surprising to see various devices being resorted to in an attempt to obtain an even dhool. Double roll-breaking is certainly a good way of getting an uniform dhool but it involves more time, more machines and more labour. Why go to all this trouble when by a suitable combination of mesh, speed and slope you can get the same results in a single operation? How then is one to set about it? In the first place ensure that the roll-breaker is fed at an even rate. This is of paramount importance as by over or under-feeding a roll breaker a wide variation of dhool size will be obtained. Next, aim at getting the size of dhool which when fired corresponds to that of B.O.P. If your dhool is larger despite the use of No. 5 mesh, the generally accepted standard which produces a dhool of the recognized size, you can correct it by either or all of the following ways:—

(a) A smaller mesh at the end of the roll-breaker.

(b) A faster speed.

(c) A steeper slope.

If it is too small decrease the speed or slope, perhaps both. As you see, the adjustment is quite easy and only requires a little ingenuity and common sense. If your factory is one of those which specializes in large leafy grades a No. 4 mesh may give the desired results and if you wish to make a high percentage of B.O.P. and Fannings No. 6 mesh will probably give the best results.

Firing.

When I turn to the consideration of firing I must remark upon a recent tendency to over-fire. Faulty inlet thermometers, absence of exhaust thermometers and long drying periods are very common not so much on the modern endless chain pressure driers, but on the older semi-automatic tilting tray types. The fully automatic drier rarely gives trouble and there is no reason why even the other types should not give equally satisfactory results if only they are properly used.

Over-loading of trays, hurried spreading of the leaf and irregular charging of the trays in the case of tilting tray machines are common faults. The factories where these faults occur invariably have trouble with dull infusions. It is unnecessary for me to stress the fact that firing is a mechanical process and even in semi-automatic driers the human element only enters in the feeding and collecting of the leaf and maintenance of temperatures, but it is still a common practice to see firing being judged by the feel of the tea. There is no need for uncertainty about firing when, by having a constant load, a constant exhaust temperature and changing trays by the clock, you can do away with such malpractices as slipping from one pulley to another, opening port holes, running a few trays empty and closing down on the fan valve. At this stage you may ask what should be the correct load for these tilting tray machines. A safe rule of thumb to follow is to work as near as possible to ½ lb. leaf per square foot of tray area. My final word of advice on firing is to take every precaution to ensure that teas are thoroughly cooled before they leave the firing room.

Grading.

Finally, I come to grading. The procedure varies to such an extent from estate to estate that unlike the other branches of manufacture no rules can be laid down. I must, however, refer to the dangers inherent in attempting to keep the percentage of off grades at too low a figure. It is very easy to spoil the appearance of the main grades by so doing. There is no hard and fast rule for the percentage of Broken Mixed, but if it is too high first look into the standard of plucking before blaming the teamaker. If you are convinced that it is not due to coarse leaf you can then be sure that the fault is due either to rolling of under-withered leaf, or too severe fittings on the roller tables. Light rolling also sometimes tends to produce more Broken Mixed and the only remedy is to put more pressure on the leaf. Finally, to avoid greying use your cutter judiciously and see that its cutting edges are always sharp. Excessive handling of freshly fired tea must also be avoided to keep teas really black in appearance.

DISCUSSION.

I. QUICK WITHERING—C. R. WEBBER.

Major O. L. M. Lebbe said that quick withering machines had been in use for over 50 years ; he himself had originally used a desiccator and now he had a Paragon drier. He asked whether the latter machine would not be more suitable and also more profitable.

Mr. Webber said he thought this was highly improbable especially from the point of view of the prices realized.

Mr. Morford asked if the output varied appreciably for wet leaf and dry leaf.

Mr. Webber said he always weighed 750 lbs of leaf wet or dry, so the output was always the same.

Mr. Dyer remarked that he had observed that the teas from this machine were rather flaky.

Mr. Webber agreed that the teas were inclined to be choppy, but no adverse comments had been received from the brokers. In fact reports indicated no difference in appearance between normal and quick withered teas, nor was there any appreciable difference in price.

In reply to various other questions, Mr. Webber said that there was no evidence either that the percentage outturn of made tea to green leaf was reduced by the use of this machine, or that there was a danger of case hardening of the leaf. He further stated that no extra labourers were required to operate the machine.

II. COMMON PROBLEMS IN TEA MANUFACTURE—E. L. KEEGEL.

Mr. Lockhead and Mr. Childerstone asked if it would be possible to arrange a conference of Teamakers, presided over by Mr. Keegel.

The Director said he would require time to consider this suggestion.

Mr. Morford and Mr. Childerstone suggested in this connection that a precis of Mr. Keegel's paper should be circulated to all teamakers. The Director agreed to this, and asked those interested to send in their names and addresses. (THIS HAS BEEN DONE—Ed.).

Mr. Morrison asked whether the recommendations regarding constant pressure were applicable at all elevations.

Mr. Keegel replied that although his recommendations were based principally on results obtained in upcountry factories, there was no reason why continuous pressure (with shorter rolls) should not give equally good results in the low-country. It was, however, advisable to raise the pressure cap for a few minutes in the middle and at the end of each roll.

The Director added that thorough circulation of the leaf the whole time was of prime importance in maintaining an even temperature in the roller.

In reply to a question by Mr. Childerstone. Mr. Keegel said that the speed recommended for E. P. rolling was the same as for batten pressure/cap rolling.

In reply to a question by Mr. Clowes, on the types of mesh in roll breakers, Mr. Keegel said that it was advisable to have a smaller mesh at the lower end, since during the passage of the dhools through the machine, the larger particles tended to accumulate there.

Mr. Birkett asked whether the use of a high pressure in the first roll would not spoil the appearance.

Mr. Keegel replied that if tip was the main consideration, it was certainly preferable to keep the first dhool out-turn as low as possible. The figures he had given referred to 3rd and 4th rolls, and might be applied to the 2nd as well.

Mr. Birkett then asked whether the percentage of big bulk was not the most important factor, since it governed the amount of cutting taking place in the sifting room, and what limited the percentage outturn of dhools.

Mr. Keegel replied that the higher the big bulk outturn the more the cutting. However, if the big bulk outturn was the same it made very little difference what percentage outturns of dhools were taken in the later rolls.

Mr. Jayawardene asked whether continuous rolling was recommended if big bulk outturn was to be reduced.

Mr. Keegel replied that in his opinion continuous rolling could not be recommended for this purpose alone, as it was apt to produce more "reds" than the orthodox system.

Mr. Clowes asked how the statement by Mr. Keegel that temperatures above 100°-110°F. would ruin the teas could be reconciled with statements by Mr. Webber.

The Director explained that fermenting enzymes were destroyed at about 120°F. but a lower temperature maintained for about 3 hours would not affect the activity of the enzymes.

Mr. Jayawardene asked what standard withering percentage was recommended.

Mr. Keegel replied that he considered that for a good average wither the leaf should contain about 55% moisture (i.e., the outturn of made tea to withered leaf would be 45%).

Mr. Childerstone asked whether it would be economic to hold crops over for certain periods and how long factory windows could be closed during withering without any detrimental effect.

The Director replied that it was not possible to state after what length of time injury to the withering leaf could be anticipated. At St. Coombs it had not been found economic to hold over crop and daily manufacture was practised.

In reply to a question by Mr. Stewart, Mr. Keegel said that in recommending a firing load for trays of ½ lb. per sq. ft. he was referring to fermented leaf.

In reply to questions on the types of battens recommended for well twisted tea—one of the most important considerations in low country manufacture—Mr. Keegel said that no special type of batten was recommended—of greater importance was the type of the fitting on the door.

The Director added that the Colombo Commercial Company M & S, and Walkers Crescent battens would probably be found suitable. These firms had co-operated with the T. R. I. and had devised a type of cone known as a "Fadeaway" cone. Of course, these true cones must not be confused with fittings used in E. P. rolling which was sometimes incorrectly referred to as cone rolling.

Arrival of His Excellency the Governor-General.

At the hour of 11-00 a.m. His Excellency the Governor-General arrived with his A. D. C. The Chairman thus addressed the Conference :—

Your Excellency, and Gentlemen :

It is an honour indeed, Sir, that you have made the long journey from Kandy this morning to be present with us at the hour appointed, and purpose your return to Colombo this evening—a considerable call on your busy occasions. We are delighted to see you present.

The Tea Research Institute of Ceylon is very conscious of its peculiar responsibility towards an Industry which has provided, and we hope will continue to provide, the main revenue of the Island. From conversation I had with you, Sir, and by your recent visit to St. Coombs, you have shown great interest and concern for the work of the Institute.

We were disappointed indeed that the Minister of Agriculture was not present with us yesterday to open this conference, and it is gratifying that you have made this visit to us today. I now invite you, Sir, to address us.

Note. The reply by His Excellency the Governor-General is given in full in volume XXI, Part IV, "Conference Number" *The Tea Quarterly*—December, 1950.

PATHOLOGICAL PROBLEMS

By

C. A. Loos.

Though many diseases and pests of the tea bush have been recorded in Ceylon in past years, the majority are of minor economic importance. Occasionally, however, when environmental conditions are suitable, outbreaks of any particular disease or pest may cause anxiety.

The disastrous effect of the fungus causing the coffee leaf disease, and the fungus causing the disease of potatoes which was responsible for the great famine a century ago bring to mind the importance of diseases, particularly those which effect foliage. The survival of tea would be doubtful if the blister blight fungus proved able to attack mature foliage instead of young leaf only. The mature pre-tipping leaf which partly fulfils the functions of food manufacture must be held by the bush through its cycle and any disease or pest which may cause it to defoliate or damage has to be controlled. One such disease is caused by the fungus *Calonectria theae* better known to most of you as the Cercosporella leaf disease of tea. That disease has been particularly widespread this year especially in areas where *Acacia decurrens* is grown as a shade tree or wind belt. The fungus, may attack mature and young tea leaves through the breathing pores or stomata and, may cause heavy defoliation of maintenance leaf when weather conditions favourable to its spread continue for a fairly long period. The type of weather which favours blister blight also favours the Cercosporella disease. When both diseases occur together the result may well be disastrous to the tea bush.

Two forms of Cercosporella attack are known on tea. Spotting of the young flush is known on a number of estates but in such cases defoliation does not occur except where *Acacia decurrens* is grown, and mist persists for a fairly long period. Where acacias abound, their small leaflets, on defoliation, often fall on and adhere to the older tea leaves and, if the acacia leaflet is infected, hyphae grow out from it and increase the adhesion. Under these circumstances a large blotch is formed on the tea leaf and spores become abundant. The tea bush then reacts by casting off the leaf. This, in my opinion, is another example of attack from a "food base" such as occurs with poria.

The problem that confronts the planter is whether the good derived from acacias is greater than the evil of the disease. On that I cannot generalise. The Nuwara Eliya estates and many others grow acacias extensively but have never had serious trouble from Cercosporella though it is always possible to find the disease on the tea. It is very likely that the weather conditions this year have favoured the disease and it is also probable that for many years more the same conditions may not arise. Careful observation can only supply the answer but in the meantime it is advisable to grow other types of shade trees if the planting of acacias can be avoided.

After a lapse of about 25 years *Corticium invisum,* the cause of black rot of tea, was observed on three upcountry estates. Its appearance, after this long period, does not necessarily mean that it has lain dormant for so long. It probably existed unnoticed in a mild form but the somewhat prolonged south west monsoon this year may have created conditions more favourable to its spread. What has to be considered, however, is that the disease is known to cause extensive damage in North India, where, on a number of estates, routine spraying with fungicides is undertaken as a control measure against its spread.

The disease, as its name implies, causes the young leaves to blacken, and rot. Only patches of the older leaf usually become infected, though if weather conditions are suitable, complete destruction of such leaves is possible. Many of the leaves fall off but some remain suspended from the stem in a more or less vertical position. The fungus forms its spores on the undersurface of apparently healthy leaves where it may be seen, with a simple lens, as a fine powdery film.

I am indebted to the Superintendent of one of the estates concerned for the census of diseased bushes in his fields.

"2,560 individual diseased bushes have been noticed scattered haphazared throughout the division. 10 patches have been marked. Affected bushes range in number from 10 to 360 while the total number of diseased bushes in patches is 1,280." The affected bushes and a ring of healthy tea were pruned, the prunings burnt and the frames sprayed with three heavy applications of copper fungicide to which the fungus is particularly susceptible. Whether the disease will make its appearance during the next rainy season yet remains to be seen.

Corticium invisum forms minute sclerotia or specialised parts of compact fungus in the primary bark of stems and in cracks in the larger branches. These sclerotia resist desiccation for fairly considerable periods and are probably the main means of survival from one season to the next. When weather conditions are favourable the sclerotia begin to grow ; fine strands of fungus mycelium grow out from it and extend along the stems and on to the leaves where the disease symptoms appear.

The poria root disease of tea was chosen as the subject of a conference address in 1937. At that time the disease was considered of major economic importance and control measures which were the outcome of experimental work on St. Coombs were advocated. We advised the removal and destruction by fire, of all dead and diseased bushes *together with* one complete row of healthy tea bushes on the perimeter of each patch. If that work is done satisfactorily and if all pieces of infected roots are collected, poria can be exterminated. But in many cases the method did not meet with approval as, it was argued, a number of high yielding bushes were sacrificed in each diseased patch. The policy of removing only dead bushes therefore continued with the result that the fungus slowly but surely took its ever increasing toll. In 10 years the ring of healthy tea no longer existed while 3 or 4 other rows had become infected too. The patch became alarmingly large and the fungus was still active. What could have been a sheet of tea, if correct control measures were adopted, was now a bald patch on the landscape. In the meantime new centres of infection had sprung up, arising from bits of diseased roots dropped along foot paths and short cuts by labourers.

On one estate which I visited recently removals until 1946 were confined to dead bushes only with the result that the patches had extended alarmingly in size. At this late stage the recommended control measures were adopted but were then, of necessity, very costly. Bush removals and the costs involved are as follows :—

Year.	Bush Removals.	Costs.
		Rs.
1946	10,459	2,339
1947	7,079	2,717
1948	30,693	16,280
1949	42,530	20,989
1950 (To Sept.)	32,794	20,258
	123,555	62,583

At the estimated stand of 3,000 bushes to an acre approximately 39 acres now lie fallow.

Many low-country planters have been faced with the problem of root diseases in areas being replanted from rubber to tea. The popular belief in planting circles is that the poisoning of rubber trees with sodium arsenite removes the danger of the subsequent spread of root disease fungi, and that poisoning kills the fungus in infected roots. Nothing is further from the truth. Sodium arsenite travels only a short distance on either side of the injection point. It kills the tree quickly and with death the root system is invaded by saprophytic fungi which break down the cell tissues to make them untenable to parasitic forms. If sodium arsenite did enter the whole plant system, no fungus either saprophyte or parasite could use those tissues. What is poisonous to one is just as toxic to the other.

What then is the ideal to aim at? Undoubtedly it is to kill the root system of the shade or jungle tree as fast as possible to permit its invasion with saprophytic fungi before the tree is felled and large cuts exposed to spore infections by parasitic forms. Ring-barking to kill the root system prior to felling operations is the obvious answer. Trees known to be infected with root disease fungi must, however, be singled out and all diseased roots removed and destroyed in the usual manner.

Nematodes or eelworms are a group of very minute animals that inhabit soil. Many thousands of species are known to exist, the great majority being saprophytic forms which feed on bacteria and other soft foods but are incapable of causing direct damage to plants. Of the plant parasitic species two are known as pests on tea and green manures.

The better known plant parasitic species is the root knot eelworm which lives in the roots of tea seedlings, Tephrosias and dadaps, and in which it forms the characteristic knots or galls. In the larval or eel-like stage the worm is very active but when entry into a susceptible root is achieved, the worms settle down to a sedentary life to complete their life cycle and the propagation of their kind.

In early stages of growth, tea seedlings are very susceptible to infestation but with age, the plant appears to acquire immunity or the worm for some other unknown reason leaves the rootlets. On the other hand we have evidence that the root knot eelworm is a pest of mature tea in three estates in the upcountry area. There are, therefore, at least two races of the root knot eelworm, one which infests adult tea roots and the other which finds the same roots distasteful. If the so-called "adult tea" race of worms has sprung up from the race which is known to attack tea seedlings, Tephrosias and dadaps, there is then the possibility that other estates may become similarly affected.

To lessen the probability of this happening, the root knot eelworm population in the soil must be kept at a low level. Cover crops susceptible to the eelworm therefore constitute a danger. Changes must be rung periodically by a rotation of green manures as it is impossible to change the permanent crop tea. Dadaps if heavily infested must be replanted with albizzias or gliricidias if the estate is situated at an elevation low enough to grow the latter. Crotalarias should replace tephrosias. When the eelworm population in the soil is starved out for lack of a susceptible host tephrosias may then again be planted.

The other eelworm pest *Pratylenchus pratensis*, or the meadow eelworm, is now known to occur in about fifty tea plantations. The distribution is alarmingly wide, as affected estates are situated in most of the large upcountry tea growing districts. The degree of infestation of course varies from estate to estate; in some estates the problem is acute while in others the pest occurs in limited areas though its spread is gradually extending.

The total extermination of the pest in tea plantations by chemical or other measures is impracticable. No treatment can be effective unless a 100 per cent kill is possible, as a few eelworms surviving treatment can build up to gigantic numbers over a short period of time provided a susceptible crop is planted again.

Replanting or supplying with material grown from tea seed usually ends in failure, as the heavy meadow eelworm population in the soil kills the feeding roots as often as they are formed. Very encouraging results have, however, been obtained with supplies of vegetatively propagated material obtained from vigorously growing bushes in infested fields. We have suggested, and as a matter of fact the suggestions are in practice on more than one estate, the planting of this so-called resistant clonal material as a possible means of control. The proof of resistance has to be over a long period as plants must grow in infested areas for many years before success can be definitely established. The problem certainly teems with difficulties but at present I can see no easy form of control.

In the meantime the infested fields have to be kept at an economic level of productivity as heavy infestation with the meadow eelworm results in the destruction of feeding roots. In consequence foliage in direct communication with those roots die too. This continual process of death and new growth must inevitably be at the expense of stored food reserves; bush starvation is therefore the ultimate result.

It is possible by agricultural practices to keep eelworm populations in the soil at a low level and thereby lessen severe root destruction. Among soil fungi are a number of species highly specialised for trapping nematodes. The trapped eelworm rarely escapes, and its body is used by the fungus as food. A parasitic eelworm is as likely to be caught in a trap as a non-parasitic species but it should be clearly understood that the parasitic species runs this risk only at the time it is moving through soil.

The number of eelworm consuming fungi in the soil depends to a large extent upon the size of the eelworm population, the greater the number of nematodes, the greater the number of fungi which can live on them. It therefore becomes necessary to increase the population of the many species of non-parasitic nematodes by incorporating decaying organic matter into the soil. This is best done a short time prior to pruning as with the removal of foliage the bush's feeding roots die too, freeing into the soil a large percentage of their parasitic eelworms. Until new rootlets form, the eelworms are free-living, and in their wanderings through the soil are far more liable to come in contact with the trap fungi than they would if rootlets are in abundance during normal growth. Applications of organic material must be reasonably heavy — 10 to 20 tons per acre prior to pruning. After that only occasional applications will be necessary until the subsequent pruning operation.

If the fight is against the root-knot eelworm, crops immune to attack must be planted. In the case of the meadow eelworm, however, green manures whether they are susceptible or not should be grown at maximum intensity to supply the loppings for incorporation into the soil. If non-susceptible green manures grow well, undoubtedly they are preferable to crops which support the pest but the main criterion must be a bush crop which gives a large amount of loppings.

THE WORK OF THE INSTITUTE

By

J. Lamb,

Director, Tea Research of Ceylon.

The work of the Institute and the staff of the Institute are so closely related that I must refer to the profound changes which we have experienced between the two conferences. At our last conference Dr. Norris delivered this address on the work of the Institute. Even the possibility that I should deliver that address at the next conference never entered my head and the death of our Director, who was also a friend of every one of us, both junior and senior, was keenly felt by the whole staff. We have also, in the same period, lost the company of other friends; but they fortunately still flourish in their respective jobs - Dr. Gadd is fully occupied with his household duties—the fate which befalls all professional people who retire in the U. K.-Dr. Eden is the Director of the Tea Research Institute of East Africa, which is now established and settling down to assist the development of the tea industry in that country.

Mr. Portsmouth was present at the last conference but Mr. Walter, Mr. Landreth and Dr. Haworth are welcome recruits to our staff. Mr. Loos has climbed the ladder from the junior to the senior staff and Mr. Keegel and Mr. Kehl have been promoted to the Research Assistant Grade.

We are in still desperate need of the services of an experienced pathologist, the more so because we wish to send Mr. Loos, our Acting Pathologist, to England or to America in order to study eelworms, and more particularly the methods for the control of parasitic species. Mr. Loos is already an authority on the subject of eelworms parasitic on tea, and the increase in these pests in recent years is causing us grave concern. We also need the services of an experienced administrator who can assist the Director in general administrative matters, and in particular with our publications which are a source of much anxiety to us.

The value of a Research Institute is greatly diminished by failure to publish its findings and advice in the closest detail. The *Tea Quarterly* which has a world wide circulation is now well established and in recent years the amount of material requiring publication has greatly increased. It is proving more and more difficult to publish the journal at regular quarterly intervals. There is also a strong demand for a series of monographs on tea production of which No. 2 on the Commoner Diseases of Tea was published this year. I can only assure you that we are very conscious of the delays in our publications, and express the hope that in the near future we shall be able to rectify them. The third monograph should be on the subject of tea manufacture, which is my own personal responsibility. At the present moment it is quite impossible to attempt to even start the preparation of this treatise. Parts 2 and 3 of the *Tea Quarterly* are now in the press and we hope to be able to publish the 4th part containing the proceedings of the first day of the conference before the end of this year.

Our difficulties will become clearer when I tell you that postages from our main office this year have already exceeded 11,500. This excludes circulars of which 1,200 were posted in connection with this conference alone. I think you will appreciate that even circulars require much thought and careful drafting when arrangements are being made for demonstrations and conferences at which the convenience and comfort of hundreds of visitors are to be considered in detail.

Co-incidental with all the changes of staff, advisory work and advisory visits have shown a very marked increase. The Pathological department this year has already sent out 851 letters against 834 for 1949 and 497 for 1948. Up to November 425 pathological specimens have also been sent in for examination and report. The Physiological department has sent out 750 advisory letters, and 378 letters and reports have gone out in connection with tea manufacture. Mr. Keegel has already visited 42 factories some of which have been a full day's journey from St. Coombs.

We have always to weigh the importance of advisory work against basic research work, and avoid the danger of becoming a mere advisory bureau. When you find us reluctant at times, to pay a visit to a certain field which is worrying you, or to visit your factory, I hope you will understand our difficulties.

Needless to say, blister blight has occupied the major part of our time in recent months and in July, August and September, it was necessary to turn almost every member of the scientific staff on to some aspect of this work. This branch of our activities has already been dealt with in my paper on the blister blight control campaign. I feel very satisfied with the progress made in this work, but anticipate that during the next south west monsoon we shall again be obliged to concentrate most of our energies into this investigation. I also think it will be necessary to provide training courses for superintendents and possibly for other estate staff before the next south west monsoon season, if estates decide to adopt crop protection methods against blister blight.

At this juncture I wish to assure Uva planters that we realise that blister blight also occurs in the Uva province and that we will give some consideration to their special problems in due course. I do not think, however, that blister blight is causing the marked deterioration of the condition 'of the estates in Uva as it undoubtedly is in the S. W. monsoon zone. Our slogan is, bush or capital protection first, and flush or profit protection second.

I will now turn to a brief review of the activities of the various departments. First the Chemical division which is now a combination of the former Biochemical and Agricultural Chemistry departments. I hope to retain charge of this division and to be able to continue scientific work. Much work remains to be done on both pure biochemical problems and in biochemistry applied to tea manufacture. The control of temperatures during fermentation, and experiments with fermentation at 80° and 90° F. are of particular interest at the present. When the London market opens we also intend to pursue our work on epicyclic pressure rolling.

Plans for Dr. Haworth's work are however of the most interest and importance. The role of minor elements in the nutrition of plants has received such widespread attention in recent years that we must study the part they play in the nutrition of the tea bush. Dr. Eden made an intensive study of the nitrogen, phosphate and potash requirements of the bush, and Mr. Portsmouth has extended the study of potash requirements. The actual occurrence of potash deficiency has emphasised the need for a continuous study of the nutritional demands of a crop grown continuously on the same land. Dr. Haworth has already had experience in this field of work, and took the opportunity whilst in the U. K. in the early part of this year of spending a few weeks at the East Malling Research Station where much of the fundamental work on minor element nutrition has been carried out. It may well be that the supply of minor elements in tea soil is ample for all the requirements of the tea bush, but nevertheless it is high time we understood something about the role of these substances in the nutrition of tea.

In the Physiological section the development of blister blight resistant clones, more especially the types which yield well, is work of outstanding importance. The long term solution of blister blight problems in Ceylon is, so far as we can see at present, in the hands of Mr. Portsmouth and his assistants. Apart from blister blight we must, if we are to compete with other producing countries, concentrate

on replanting with high yielding types. The problems involved in replanting are many in number, and not the least of them is the improvement of soil conditions and the elimination of cumulative parasites such as eelworms, between removing the old tea and replanting the new.

We believe that grasses will assist greatly in this problem and already have a large field experiment designed to test our idea. Grasses have a most marked effect on the rebuilding of the crumb structure of soils and, as far as we know, do not harbour any of the parasites which we wish to eliminate. Two years under grass, may seem to be a long treatment for old tea soils but the possibilities of the quick establishment of suitable clones in greatly improved soils demands investigation, and may pay handsome dividends in the long run.

The Pathological division has already been mentioned in connection with eelworms and I make no apology for referring to this pest once more. The advent of blister blight has done nothing to relieve pathological problems which existed before its arrival in Ceylon and so far as eelworm is concerned we believe that the combined effect of blister blight and eelworm has greatly accentuated the effect of both diseases. I intend to do everything possible to secure the services of an experienced Pathologist and to relieve Mr. Loos for an intensive study of the eelworm problem

Finally I wish to mention our new Engineering division. For several years past I have been convinced of the necessity for an engineering division of the Tea Research Institute. The problems connected with the application of crop protection methods have brought the matter to a head, but there is a real basic need for this department and I hope that it will not be long before Mr. Landreth is able to assist us with some of the problems connected with tea manufacture. In my paper on manufacture at the last conference, I pointed out that every problem we tackle eventually develops into an engineering matter, and I now hope that the facilities available will allow us to push more of our work on tea manufacture to its logical conclusion. As we have already found, workshop facilities in a laboratory are a great asset and small pieces of apparatus and equipment which formerly took weeks to acquire are now produced in a matter of days only. The Tea Research Institute with its many bungalows, large and small, its laboratory, factory, and extensive electrical and water supply systems requires the services of a resident engineer and Mr. Landreth is already becoming one of the most harrassed members of the staff.

Plans to extend the Institute's activities have involved a great deal of work during the past year, but progress has been very disappointing. Planters from low elevations have for some years past, urged the establishment of a Low Country Sub-Station. An Officer, namely, Mr. Walter, was recruited for this work two years ago; an agreement with the Rubber Research Scheme gradually to take over their Nivitigalakele Sub-Station was reached many months ago. The Rubber Research Scheme experiments on their Nivitigalakele Sub-Station are maturing, and 50 acres of very suitable land can be made available to us in the course of the next few years.

A number of low country estates have made the most generous contributions of clonal planting material which has made rapid progress in our nurseries and can be planted out on a scale sufficient to afford a most valuable multiplication area. Unfortunately, objections have been raised to the establishment of this station and progress with this project has been very gravely impeded as a consequence.

The condition of large areas of small holdings is also causing anxiety. Over plucking, and in some areas blister blight, has caused most serious deterioration of the condition of these holdings. Co-incidental with deterioration of the bushes, soil erosion is increasing to an alarming extent.

Our present small holdings advisory service is grossly insufficient to cope with the problems involved. There are over 60,000 acres of smallholdings many of which are less than 1 acre in extent. In advisory work to estates we deal with units of several hundred acres and even this taxes our resources. An advisory service to such small units as small holdings requires a special and costly organisation. A scheme has been put forward to the Minister of Agriculture and is receiving consideration. Meanwhile, in co-operation with the Department of Agriculture, a quantity of tea seed has been distributed through our small holdings officers, and green manure seed also made available on a limited scale. We also plan to co-operate with the Department of Agriculture in the establishment of a series of demonstration plots to encourage, by visual demonstration, the better management of these areas of tea, and hope to drive home the fact that care and attention pays dividends whereas exploitation has its own reward.

DISCUSSION AND COMMENTS.

MECHANICAL PLUCKING—B. D. FAY.
(Tea Quarterly, Vol. XXI, Parts II/III page 38).

Mr. Stork asked whether mechanical plucking had a detrimental effect on the bush owing to difficulty in controlling the depth of the cut.

Mr. Portsmouth replied that this difficulty had been overcome by fitting a "skid" on the under surface of the machine, which could be adjusted so as to give a cut from $\frac{1}{4}$" to 2" above the previous one—thus constantly raising the plucking table. This addition made normal full leaf plucking quite possible.

In answer to a question by Mr. Thambipillai on coarse leaf, Mr. Portsmouth said that experiments were in progress to try and determine the optimum length of plucking round to give the best results. It was essential that the bushes should be adequately prepared for mechanical plucking by obtaining a flat plucking table and the only way this could be achieved was by starting mechanical plucking immediately after tipping.

Mr. Fay added that he had adopted a plucking round of 14—15 days.

In answer to a suggestion by Mr. Glen Dickson, Mr. Fay said that it would not be feasible to change over from machine plucking to hand plucking in off periods, in order to avoid incurring the increased costs of mechanical plucking in off periods.

Mr. Lockhead asked whether Mr. Fay felt justified in mechanising the whole of the plucking on his estate.

Mr. Fay said that this question was being investigated with a view to a decision in the very near future.

Mr. Jayawardene asked whether any extra pay was given to the mechanical plucking labourers, and whether women could operate the machines.

Mr. Fay replied that he did not consider any extra pay necessary. Although he had not tried women at this work yet, the comparatively light load to be carried made it well within their scope.

In answer to a question by the Chairman on the costs of the machines, Mr. Fay gave the following details :—

(i) prototype of the engine-driven knapsack model (complete).....£49.10.0. This price should be substantially reduced when the machine is mass produced.

(ii) battery of six electrically driven machines, complete with 1 K. W. generator, cables, etc.....£56.0.0 per machine.

In replying to a number of other questions, Mr. Fay made the following statements. These machines came into production in May, 1946, and he had not heard of similar ones being used before in Kenya. He was unable to give details concerning the availability of the knapsack equipment which was now being redesigned in London. The machines as used so far had either been powered by electricity or a petrol engine and compressed air had not yet been used. The cost of the machine had not been included in the cost of production figures quoted. He had not yet machine plucked a full cycle. There was no inherent difficulty about using the machine for slope plucking. His electrically driven machines were still giving satisfactory service after 2000 hours, though 1/3 of the cables originally in use had worn out.

PATHOLOGICAL PROBLEMS—C. A. LOOS.

Eelworm. Mr. K. Morford gave some details of the practical control measures he had undertaken in connection with eelworm, which had first been reported on the estates in question in 1936. On the advice of Dr. Gadd, applications of compost at the rate of 15—20 tons per acre had been carried out at intervals over the last 14 years. Supply holes had been cut in the eelworm infested patches at the rate of 1500—1700 holes per acre, and these had been filled with compost made largely from weeds and sunflower, heaped in central sites near lines. Cost of holing and filling (excluding D. A.) amounted to Rs. 56.00 per acre, to which transport (by bullock carts) added a further Rs. 15/- per acre.

He had been very satisfied with the results obtained, and there were adequate indications that this prolonged treatment had proved successful if not in eradicating the eelworm, at least in reducing the population in the soil to insignificant proportions.

Poria. In reply to a number of questions on this subject, Mr. Loos said that identification of the poria root disease fungus was well within the scope of the average labourer. On many estates where poria eradication was now a routine work, labourers found no difficulty in recognising the fungus on diseased roots.

If adequate supervision had been lacking during removal of diseased bushes, it was essential to plant up the cleared patch with an indicator plant such as *Tephrosia vogelii* or *Crotalaria*. If the indicator plant dies of the poria disease it should be carefully removed and a search made for the infecting tea root. If deaths do not occur amongst the indicator plants in a period of two years the patch may be replanted with tea.

Black Rot. In answering various questions on this disease, Mr. Loos said that it was caused by the corticium fungus—*Corticium invisum*. It was found at an elevation of 4—5,000 feet and should not be confused with *Rhizoctonia solani* which was a very similar—though not so serious—fungus disease which occurred in the low-country. Control could be effected by heavy applications of a copper fungicide.

Brown blight. In answer to a question by Mr. van Maurik, Mr. Loos said that this is not considered to be a primary disease. The fungus was commonly found on sun scorch patches and blister infections, but could cause die back far more rapidly than blister blight alone.

Shot-hole borer. In answer to a question by Mr. Perkins, Mr. Austin said that experiments on shot-hole borer had been carried out in the Uva District as a result of which it had been found that incidence of the shot hole borer during the

third year of the pruning cycle showed a marked decrease. Experiments with various types of spraying—including Gammexane and D. D. T. were also being carried out, but these were still in the experimental stage.

As was well known Dr. Gadd had spent his last months at the Institute making an extensive study of shot hole borer, the results of which had been published in the *Tea Quarterly*.

The Identification and Control of diseases. In response to suggestions by Mr. Andrews, and Mr. W. A. Young, the Director said that it would be possible either to arrange short courses on this subject or for Mr. Loos to give lectures at P. A. meetings with the help of the colour slides he was now preparing. It was agreed that the latter suggestion would meet the situation.

THE WORK OF THE INSTITUTE.—THE DIRECTOR.

In answer to a request that the T. R. I. should organise courses for training conductors in blister blight control work, the Director said that a separate branch of the Institute, with additional staff, would be required for this. The Institute was primarily concerned with research, and without special staff it was not possible to undertake work of this nature.

OPEN DISCUSSION.

Manuring. *Mr. D. C. A. Goonewardene asked whether at yield levels up to* 2000 *lbs./acre, the correspondingly high applications of sulphate of ammonia and phosphate would have any harmful effects.*

The Director replied that there was no reason to suppose that high applications of sulphate of ammonia would be harmful—in fact correspondingly high applications of nitrogen were essential to maintain yields at such high levels. It was, however, necessary to use a "balanced mixture"—i.e., one which contained an adequate amount of the three elements to replace the amounts of those removed by the crop.

Regarding high phosphate applications he pointed out that although phosphates combined with iron, there was little danger that an iron deficiency would occur, owing to the high amount of iron present in acid tea soils; moreover, leaf analyses from a number of samples had confirmed this. However, he hoped that Dr. Haworth's forthcoming researches on minor elements would reveal any minor element deficiency which might arise as a result of very high manurial applications.

He added, in answer to various other questions on this subject, that although manure applications must be in direct proportion to the amount of crop removed by the bush (6½ lbs. N, 1½ lbs. P2O5. and 4 lbs. K2O. per 100 lbs. made tea)—allowance had to be made for the fact that the total amount of nutrient elements added were not available to the tea bush. For instance, 50% fixation of phosphates into a highly insoluble form could be anticipated, so the amounts of this nutrient in manurial mixtures were based on at least double the replacement values.

Mr. Portsmouth developed the question of availability of mineral nutrients in the soil, and pointed out that soil analysis were of little or no value in determining what manure should be added to any particular area; such analyses would merely indicate the total amount of any nutrient element in the soil, and not how much of it was available in a form which could be taken up by the roots of the tea bush, which had limited powers of extraction for which no standard laboratory equivalent had yet been found.

Lime wash. In answer to a question by Mr. Helling, Mr. Portsmouth said that experiments with lime wash at Passara showed that the treatment was highly beneficial; bud break on the older wood was definitely accelerated, and more buds

were found on lime washed bushes compared with untreated ones, or those treated with caustic soda.

He added that lime should on no account be added to tea soils, since tea required an acid soil and any appreciable addition of lime would reduce the soil acidity.

Stalk extraction. In answer to a question by Mr. Glen Dickson on this subject, the Director said that the Institute would shortly be importing a new sifter the Middleton Stalk Extractor—and tests would be carried out with this machine.

He could not forbear to point out, however, that stalk should not be in the tea in the first place.

Address by Dr. J. H. van Emden (Experimental Station, Buitenzorg, Java). Dr. van Emden thanked the Director for the invitation to Dr. van Hell and himself to attend the conference, and the planters they had met during their short stay in the Island for their hospitality.

He said he had attended the symposium on blister blight last year, when the control of the disease was a very open question. Since then, however, it had been demonstrated experimentally that direct control of blister blight was technically possible at comparatively low cost and he was amazed that this result had been achieved in the space of one year.

He congratulated the Director and his staff on the great progress made in such a short time.

Address by Mr. G. K. Newton (Chairman, Agency Section, Planters' Association of Ceylon). Mr. Newton said that the proprietory, interests, which as Chairman of the Agency Section he represented, were very appreciative of the work being done by the T. R. I. Dr. Norris had set a fine example; Mr. Lamb, carrying on his tradition, had in the short time he had been Director, enhanced the already high reputation of the Institute, and with him he linked his staff of very able officers.

On behalf of the proprietors, he congratulated the Director and his staff on the way the conference had been organised and carried out.

SUMMING-UP BY THE CHAIRMAN.

Gentlemen:—

On Saturday, His Excellency the Governor-General stated that he hoped that those responsible for the welfare of the Tea Industry would never be regarded as "defaulting trustees". I omit any reference to his remarks on the exploitation of estates, which will seriously harm the tea and the soil on those estates, as well as reacting on the economic stability of the Island.

So it is that, as 'trustees', it is our duty to realise our responsibility. The long term solution of the course we should adopt for the future against blister blight is undoubtedly that of replanting with blister resisting material in soil that has been reconditioned by green manures, grasses, compost or otherwise as emphasised by Mr. Portsmouth. Not only will this have the desirability of replacing bushes of great age, which have not the size or spread they should have, due mainly to the murderous pruning in the past; but, after four years or so, we shall

be getting a return equal, probably, to that harvested from the same areas previously, and an increasing yield in every succeeding year if the necessary cultivation is provided, and so will our replanted acreage be equivalent to anything up to four times the original acreage, as is shown by several of the clones planted on St. Coombs by vegetative propagation.

But, we cannot afford to neglect our old tea, and our Scientists should have convinced us at this conference that our duty for next year, and, perhaps, for years to come is to safeguard our tea from the ravages of blister blight by spraying and or dusting. The precise experiment on Kataboola estate has shown us that we shall be able once again not only to prune during the monsoons, but to gain much additional crop; and what is of paramount consideration, we shall preserve the vitality of our bushes and, therefore, the capital value of our estates.

It is gratifying indeed that Plant Protection Ltd., Pest Control Ltd., Universal Crop Protection Ltd., and the Shell Co., Ltd., have been able to spend so much time in Ceylon studying our problems. We hope that they will be able to evolve really efficient and economic apparatus suitable for spraying and dusting, as well as sprays and dust at low cost. If a systemic fungicide can be produced, the fight against blister blight will be mainly won.

I would like you to ponder on the wisdom of the Planters' Association having resolved to constitute the Tea Research Institute of Ceylon some 25 years ago. Our position without its existence would be bewildering indeed. The officers during the years that have passed have contributed much to our knowledge and benefit, and, although the Institute for some years has been short-handed as regards its senior staff, its reputation has been maintained by the vast amount of information disseminated in the past and again at this conference. As I see it, by the confidence you, Gentlemen, have shown in the Institute, I consider that its activities and influence will be greater than ever before, and are going to be a great strain on the energy of our officers in the future. I hope I can give them your assurance and mine that we will do all we can to assist them in their efforts.

Gentlemen, your attendance at the two sessions has been excellent—about 680 in all—and is a clear indication of how seriously the menace of blister blight is regarded by the tea planting community. I trust that you have enjoyed the papers that have been read, and hope that they have given you much to think about in the future. I thank you for the patience you have evidenced and for your contributions to the discussion.

Earlier in the proceedings, I expressed our thanks to those who have carried out spraying experiments, which have contributed much to our knowledge of the value and cost of spraying, especially in the case of the experiment on Kataboola.

Additionally, I tender our thanks to—

The Directors and Agents of Castlereagh Estate for allowing the dusting experiment to be conducted on that estate, and to Dr. Dike and Mr. Baker for the thorough manner in which it was conducted, and the encouraging results to be gleaned therefrom ;

To Mr. Webber and Mr. Fay for their part in the proceedings, and for the public spirited manner in which they have come forward to acquaint us with the results of their research ;

To Mr. de Costa, Manager of this Cinema, and to Ceylon Theatres, Ltd., for making this pavilion available to us at a reasonable rental ;

To Messrs. Harrisons Lister Engineering, Ltd., for providing the fluorescent lighting ;

To the Ceylon Tea Propaganda Board for providing their van for most acceptable cups of tea ;

To the 'Daily News', 'Times' and 'Observer' for covering the proceedings of the conference;

And to the ladies who provided the flowers on the stage.

And, finally, to the Director and his staff for the excellent arrangements they made for this conference, and for the most interesting papers they have read and the ready manner in which they have replied to questions during discussions. May I say that I have taken but little part in the arrangements. I am sure you will agree that the provision of slides by lantern makes a pleasant diversion and a ready method of taking in figures illustrating the lectures. The short films too have proved of interest and instruction.

And so we have arrived at the end of the ninth conference. I have been very honoured to preside at this conference, and am proud to feel that it has been the success we hoped it would be. We trust that the Institute has done its duty in providing as much information as time and circumstances have permitted in the case of blister blight, and that, in the case of other aspects of the tea industry as illustrated by the Director in his address on the work of the Institute, the Institute has not been lacking in research and recommendation.

I extend to you my best wishes that the Tea Industry of Ceylon will maintain its vitality and excellence, and contribute in the future, as in the past, to the economic stability of the Island; that we shall never be known as "defaulting trustees."

With these words, I declare this ninth conference of the Tea Research Institute of Ceylon closed.

Mr. Notley and Mr Mr. Groves, at the respective conferences, proposed a vote of thanks to the Chairman for his contribution towards making the conference such a success, and for the excellent work he had done since becoming Chairman of the Institute—an office which they hoped he would hold for many years to come.

MINUTES OF THE MEETING OF THE BOARD OF THE TEA RESEARCH INSTITUTE OF CEYLON HELD AT 2-30 P. M. ON WEDNESDAY, DECEMBER 20TH, 1950, AT THE OFFICES OF THE PLANTERS' ASSOCIATION OF CEYLON, 113, STEUART, PLACE, COLOMBO.

Present.—Mr. R. C Scott, C.B.E. (Chairman); The Chairman, Planters' Association of Ceylon (Mr. R. C. L. Notley); The Chairman, Agency Section, Planters' Association of Ceylon (Mr. G. K. Newton); The Acting Director of Agriculture (Dr. A. W. R. Joachim); The Acting Secretary to the Treasury (Mr. A. G. Ranasinha, C.M.G., C.B.E., C.C.S,; Messrs. R. Singleton Salmon, C.B.E., H. de T. Wilkinson Kay, J. C. Kelly, W. H. Attfield, H. S. Hurst, and Mr. J. Lamb (Director and Secretary).

Messrs. W. Neal de Alwis, J.P., U.M., Leo B. de Mel, J.P., U.M., Errol Jayawickreme and the Acting Superintendent, St. Coombs Estate (Mr, Bruce Gibbon) were present by invitation.

Notice convening the meeting was read.

1. Membership of the Board and Committees.

(a) Board.

The Chairman reported that :—

(i) Mr. F. A. Bond had resigned his seat as from the 15th November, 1950, and Mr. W. H. Attfield had been nominated by the Agency Section of the Planters' Association to fill the vacancy.

(ii) Mr. A. G. Ranasinha, C.M.G., C.B.E., C.C.S., had been appointed to act for Mr. T. D. Perera, C.M.G., C.C.S., Secretary to the Treasury, during the latter's period of absence from the Island on leave.

The Chairman on behalf of the Board thanked Mr. Bond for the valuable service he had rendered to the Institute as a member of the Board and extended a cordial welcome to Messrs. Attfield and Ranasinha.

(b) **Estate and Experimental Sub-Committee.**

The Chairman reported that Mr. S. Vytilingam had accepted the Board's invitation to serve on the above Sub-Committee.

2 **Minutes of the Meeting of the Estate and Experimental Sub-Committee held on Saturday, 9th December. 1950.**

The Chairman said that as will be seen from the copies of the minutes which were before them, the main item considered at the above meeting was the St. Coombs Estate Estimates for 1951.

3. **Finance.**

(i) **St. Coombs Estate Extsa Votes for 1951.**

The Chairman invited the attention of members to the list of extra votes amounting to Rs. 20,355/78 in all asked for by the Acting Superintendent, St. Coombs, and copies of which have been tabled. These were very fully considered by the Estate and Experimental Sub-Committee on the 9th of December and the over-expenditure in most items was due to the increase in dearness allowance and wages.

Mr. G. K. Newton said that the members of the Estate and Experimental Sub-Committee were all satisfied that this was unavoidable and proposed that the votes asked for should be sanctioned. Mr. J. C. Kelly seconded the proposal which was passed.

(iii) **Estimates for 1951.**

The Chairman said that the estimates for 1951 had been very carefully scrutinised in the morning by the Finance Sub-Committee. He proposed to go through the estimates seriatim and invited any member of the Board to ask questions relevant to each item as it came up for consideration.

(a) **Estate Estimates. Revenue Account.** The Chairman said that the total estimated expenditure for 1951 was Rs. 407,543/82 with the cost of production at Rs. 1.85 per lb. as against Rs. 349,828/38 and a cost of production of Rs. 1.59 in 1950. The crop for 1951 was estimated at 220,000 lbs. which at an average selling price of Rs. 2/24 would bring the receipts from sales to Rs. 492,800/-. The estimated profit from St. Coombs for 1951 would therefore amount to Rs. 85,250. He referred to the note on the last page of the estimates where comparative figures were given to show that increases in wages and dearness allowance paid to staff and labourers accounted for the increase in cost of production.

(b) **Research Estimates.**

Capital Account. The Chairman said that estimated expenditure on capital account on the research side amounted to Rs. 172,900. It was pointed out that Rs. 65,700 out of the total of Rs. 95,450 were revotes from 1950 for the extension to the laboratory building (administration block), the Roland Norris Memorial Hall and water sanitation for the St. Coombs cadday. Provision was also made for reconditioning one set of sub-staff quarters and for building another. Provision for capital expenditure on the Low-Country Sub-Station was also necessary.

Research Revenue Account. The Chairman pointed out that the increase in the total of the estimated expenditure on Research Revenue Account for 1951 over that for 1950 was attributable to increases in salaries and dearness allowances.

There being no amendments to the Research Estimates the complete estimates for year 1951 were approved on the proposal of Mr. J. C. Kelly seconded by Mr. H. de T. Wilkinson Kay.

4. **Any Other Business.**

(a) **Analytical Control.** The Director raised the matter of analytical control which the Institute was being asked to undertake in view of the possibility of estates undertaking large scale spraying as a protective measure against blister blight. He had been in communication with the Planters' Association and has also discussed the matter with the staff. He said that if the scheme was to be set up additional staff comprising 1 graduate, 1 officer on junior staff grade and 1 peon would be required as it would be impossible for the present staff to carry out the work. This would in turn necessitate the building of additional quarters to accommodate the staff. He estimated the revenue expenditure to be about Rs. 30,000 and capital expenditure about Rs. 57,205 making a total of Rs. 87,205. On a basis of 500 samples per week in duplicate, i.e. approximately 50,000 actual determinations per annum it would be necessary to levy a charge of Rs. 1.50 per sample to offset the revenue expenditure incurred. Requests for such analyses were being received from estates and if the Institute were to undertake such work with the present staff it would mean the closing down of all routine work now in hand.

Mr. R. C. L. Notley said that it was very essential that no teas should be exported from Ceylon having a copper content in excess of the tolerance figure allowed. He thought the T. R. I. should get the scheme going, engage staff, put up buildings to house them and charge fees for the work undertaken.

Mr. H. de T. Wilkinson Kay thought that the estimate of 100,000 samples per annum rather an optimistic figure and that the Institute should be protected in the matter of finance.

The Director said that the Institute could not afford to set the scheme going as funds were not available and thought it would be difficult to undertake the work unless the Institute was provided with the necessary finances.

In the discussion that followed all members were convinced that the carrying out of such analyses of tea samples was a definite necessity and that ways and means of obtaining the required funds should be explored.

Finally the Board agreed to the Chairman's suggestion that the Institute should not undertake to carry out such analyses until a separate department was set up and further that the Institute should not be committed to any extra expenditure or work which would impede the normal routine of research work now in progress.

(b) **(9th Biennial Conference.** The Chairman paid tribute to the Director and his staff for the excellent conference which was held in Nuwara Eliya on the 1st and 2nd December and repeated on the 4th and 5th December. Everyone he had met aud spoken to regarding this conference had nothing but praise for the very excellent arrangements and the high standard of the papers read out. He moved that the Board record its appreciation. Passed with acclamation.

The meeting terminated with the Chairman wishing the members a 'Happy Christmas and a Bright and Prosperous New Year'.

(Sgd.) J. LAMB,
Secretary.

Tea Research Institute,
Talawakelle.
19.2.51.

MINUTES OF THE MEETING OF THE BOARD OF THE TEA RESEARCH INSTITUTE OF CEYLON HELD AT 10.30 A. M. ON WEDNESDAY, 14TH FEBRUARY, 1951, AT THE OFFICES OF THE PLANTERS' ASSOCIATION OF CEYLON, 113, STEUART PLACE, COLOMBO.

Present. Mr. R. C. Scott, C.B.E. (Chairman); The Acting Director of Agriculture (Dr. A. W. R. Joachim, M.B.E.); The Acting Secretary to the Treasury (Mr. A. G. Ranasinha, C.M.G., C.B.E., C.C.S.); Messrs. V. G. W. Ratnayake, M.B.E. M.P., J. C. Kelly, H. de T. Wilkinson Kay, W. H. Attfield and J. Lamb (Director and Secretary).

Letters from the Chairman, Planters' Association of Ceylon (Mr. R. C. L. Notley) and the Chairman, Agency Section, Planters' Association of Ceylon (Mr. R. S. Davies) and a telegram from Mr. H. S. Hurst were received regretting their inability to attend.

1. Notice convening the meeting was read.

2 The minutes of the meeting held on 20th December, 1951. were confirmed subject to the inclusion of the following omission. On page 4 under Estimates (St. Coombs Estate) Capital Account, Vote 73 Buildings — Estate School. ...

"It was agreed that the entire building for the school, cost of which is to be shared with Mattakelle, should be on St. Coombs Estate".

3. **Membership of the Board.**

The Chairman reported that Mr. R. S. Davies of Messrs. Boustead Bros., Ltd., became an ex-officio member of the Board with effect from the 18th January, 1951, on his having been elected Chairman of the Agency Section of the Planters' Association of Ceylon, vice Mr. G. K. Newton resigned.

He referred to the great interest Mr. Newton had always shown in the affairs of the Board and the valuable services he had rendered as a member. On behalf of the entire Board he proposed a special vote of thanks to Mr. Newton. He then extended a cordial welcome to Mr. R. S. Davies who took Mr. Newton's place on the Board.

4 **Low-country Sub-station.**

The Chairman reported that Mr. T. E. Walter, Scientific Officer, had moved to Nivitigalakele as from 1st February, 1951.

5. **Any Other Business.**

(a) **Small Holdings.** The Chairman reported that a meeting at which Mr. V. C. W. Ratnayake, Dr. A. W. R. Joachim, Mr. U. B. Unamboowe and the three Small Holdings Officers would be present had been convened and would take place at St Coombs on Thursday, 20th February, to consider the Small Holdings Advisory Service.

(b) **Visit of the Minister of Agriculture to St. Coombs.** The Director reported that Mr. Dudley Senanayake, the Minister of Agriculture, was paying an official visit to the Tea Research Institute at 10.00 a.m. on Thursday, 29th March. He considered it would be advantageous to hold the next meeting of the Board at St Coombs at 2.30 p.m. on Wednesday, 28th March. This would permit members of the Board to be present at the time of the Minister's visit.

(c) **Handbill on Blister Blight.** Mr. V. G. W. Ratnayake tabled an illustration on blister blight which he had obtained while he was in Indonesia recently. He considered it a very useful poster to be issued for exhibition at Post Offices, Railway Stations, etc.

The Director agreed to arrange for the printing and distribution of these posters as suggested.

(Sgd.) J. LAMB,
Secretary

Tea Research Institute,
Talawakelle,
10th April, 1951.

NOTICES.

The Institute's Laboratories and Offices are situated at St. Coombs, Talawakelle, and all applications and enquiries should be addressed to the Director, Tea Research Institute, St. Coombs, Talawakelle

Specimens and other consignments sent by rail should be forwarded to Talawakelle Station c/o Messrs M. Y. Hemachandra & Co., Forwarding Agents. *Carriage should be pre-paid.*

Visitors' Days. The *second* and *last* Wednesdays in each month have been set aside as Visitor's Days at St. Coombs Estate and also at the T. R. I. Sub-Station, Gonakelle Estate, Passara, when it is hoped anyone interested will visit the Stations.

Rules for the Occupation of St. Coombs Guest House

(1) The Guest House is normally intended for the use of persons visiting the Institute and St. Coombs Estate on business. Children can in no circumstances be accommodated.

(2) Permission to occupy a room for the night must be obtained from the Director in writing and, unless sufficient notice be given, accommodation cannot be guaranteed.

(3) All visitors must sign the Visitors' Book on arrival.

(4) A bedroom may not be occupied for more than one night if required by another visitor. This shall not apply to Members of the Board or of Committees meeting at St Coombs who shall also be entitled to priority in the allocation of accommodation when on official business.

(5) Complaints or suggestions shall be entered in the book provided for the purpose and not made to the Guest House Staff. All payments due for services rendered shall be made in *cash* to the Guest House Keeper and a receipt obtained from him on the official form. The scale of approved charges is posted in the building. The Guest House Keeper is forbidden to give credit or to accept cheques.

(6) All breakages will be charged for at cost price.